AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.

The Wood & Bailie Ice Machine.

The engraving represents an ice or refrigerating machine, designed for use where moderate quantities of ice are required, as in towns and villages, in hotels, etc. It is also, from its construction particularly adapted to be used on shipboard, having been placed upon several of the finest yachts in the country, and on Government vessels.

The medium used is anhydrous ammonia, which is obtained at low cost, and which never being changed the only loss is from leakage, which is hardly appreciable.

The machine shown occupies a floor space of 48″×48″. It is simple in design and construction, and not liable to derangement. All the working parts can be readily inspected, and removed for repairs, if required, without breaking of joints or loss of gas.

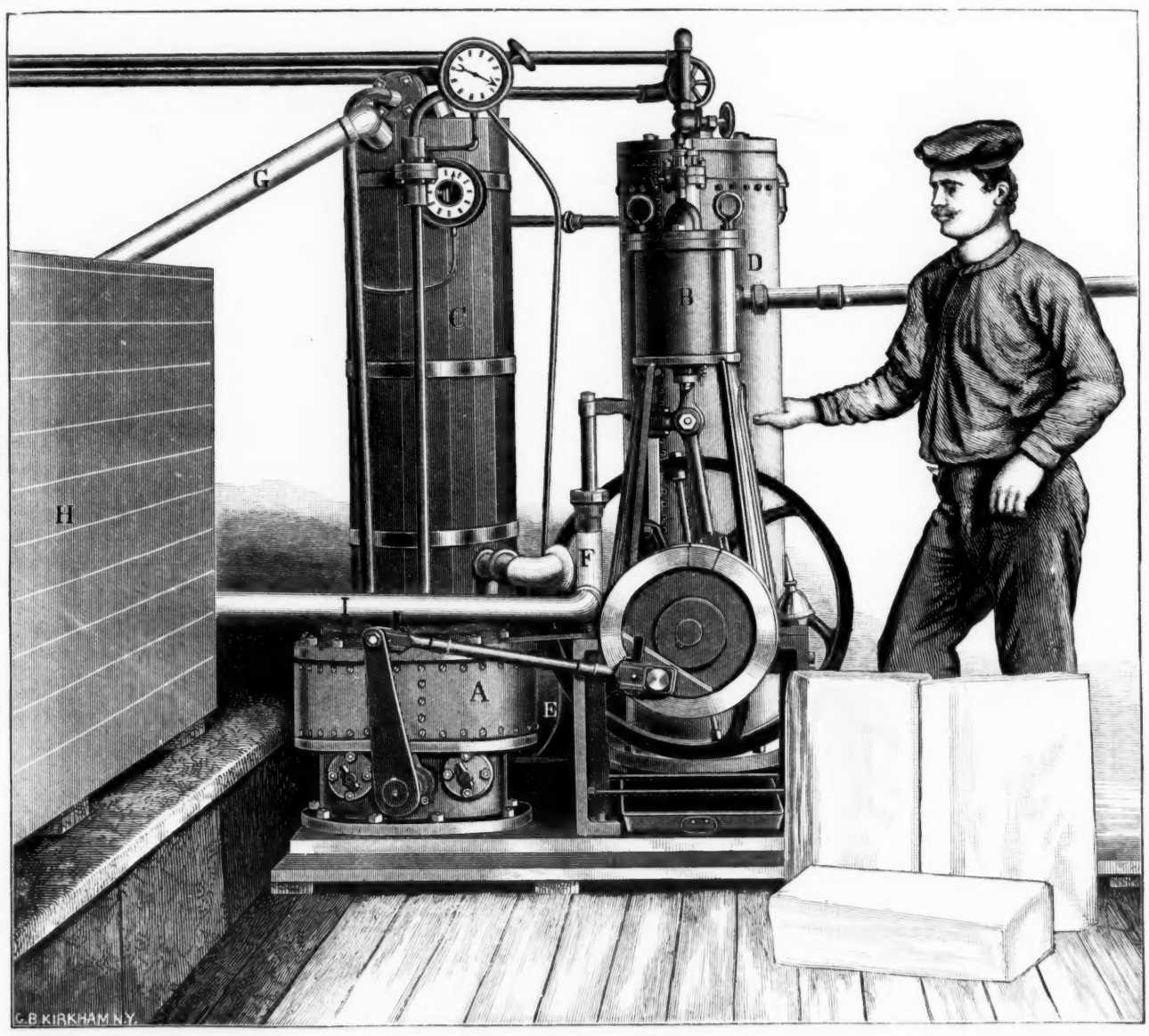
As will be seen, the machine is complete on one base, including steam engine, refrigerator, condenser, receiver and circulating pumps. This allows the machine as a whole to be put together in the shop, and permits of its successful operation under circumstances where it could not be otherwise successfully used, as on shipboard, where the straining of the working parts would cause leaky joints if the parts were separate.

The machine is built of the best material, so as to secure the necessary strength without excessive weight. The parts are made to standard gauges, so as to be duplicated without delay should it be necessary. It is furnished with governor automatic oiling devices, etc., so but little attention is required from the engineer.

No especial skill is required to operate, any one who is competent to care for a small steam engine being competent to manage the machine.

The parts referred to by letters in the engraving are: *A*, gas compressor; *B*, steam engine; *C*, refrigerator; *D*, condenser; *E*, ammonia receiver; *F*, circulating pumps; *G*, brine discharge pipe; *H*, freezing tank or cold room; *I*, brine suction pipe.

These machines, which are used for refrigerating rooms as well as for ice making, are made by Wood & Bailie; address, P. O. box 349, Washington, D. C.



THE WOOD & BAILIE ICE MACHINE.

The President of the United States has asked Congress to make an appropriation to cover the expenses of preparing a Government exhibit for the Cotton Centennial Exposition. He deems it advisable to place on exhibition a collection of articles to illustrate the resources of the country, its methods of government administration, and its means of offense and defense. In making the application, he says:

"The importance, purposes, and benefits of the New Orleans Exhibition are continental in their scope. Standing at the theshold of the almost unopened markets of Spanish and Portuguese America, New Orleans is a natural gateway to their trade, and the exhibition offers to the people of Mexico and Central and South America an adequate knowledge of our farming implements, metal manufactures, cotton and woolen goods, and the like necessities of existence in respect to which those countries are either deficient or supplied to a limited extent. The breaking down of the barriers which still separate us from the republics of America, whose productions so entirely complement our own will aid greatly in removing the disparity of commercial intercourse, under which less than 10 per cent. of our exports goes to American countries. I trust that Congress wil realize the urgency of this recommendation and make its appropriation immediately available, so that the board may lose no time in undertaking the extensive preparations necessary to spread a more intimate knowledge of our governmental institutions and national resources among the people of our country and of neighboring States in a way to command the respect due it in the family of nations."

A Cable Tramway in London.

With imposing ceremonies, where the Lord Mayor and other fantastically-attired civic dignitaries participated, London has just opened its first cable street railway. A leading northern thoroughfare of that great city crosses a steep grade, well known as Highgate Hill. In the long by-gone times this hill and its environs was a favorite resort of the Dick Turpin fraternity, for it was then away in the green fields outside the noise of the city tumult. On the city side of this hill a carved stone locates the spot where Dick Whittington rested, and heard Bow Bells calling on him to return to London. Of late years the city has spread beyond Highgate Hill, and the steep grade proved a great obstacle to the facilitating of passenger traffic. The ancient 'bus was endured till even long-suffering London became impatient for improvement, and parliamentary powers were granted to a company to construct and operate a cable tramway. Before a decision was made as to the power to be used in propelling the cars on this line, every system of tramway locomotion was thoroughly considered. The decision in favor of the cable there was made by a committee of engineers. Horses were considered not only too expensive, but incompetent for the heavy and variable traffic. Locomotives were objectionable as noisy, dirty, and attended with many dangers from fire and lack of control, besides the difficulties brought about by their weight, and the consequent wear of the tram rails. Compressed air motors were regarded as unsuitable on account of their heavy outside expenses in the necessary provision of stationary compressing engines, and the reduction of power in the loss by conversion of so large a proportion of the original engine power into heat during the compression of the air. Electric motors are not yet in the field, and, so far as any efforts in this way have yet been made, none appears to be sufficiently economical or practical for immediate introduction. Among those recommended, no electric motor appeared capable of working on such steep gradients as that of Highgate. What were regarded as the chief merits of the cable system for such heavy work are that the cable has inherent strength enough to haul the dead weight of the cars and their freights up-hill, and this without being dependent on weight gravitating upon the street rails for traction, as in the case of all locomotives, whether driven by steam, compressed air, or by storage batteries of electricity. The steel wire rope—which is made endless by very carefully splicing, extending over forty feet, in order to secure a joint, which shall not be larger than the uniform dimensions of the cable—is seven-eighths of an inch in diameter, and composed of six crucible steel wire strands, wound over a hemp core. The line is sinuous and irregular, and consequently it has exercised all the skill of the practical engineers to overcome the difficulties encountered in the best and most efficacious ways. It is about a mile in length, and the many curves vary in their radii from three thou-

sand to five hundred feet, except at the points or switches, where the radius is 75 feet, and at the engine-house, where it is 60 feet. The gradients of the road vary from one in ten to one in 75. The character of the road has necessitated frequent deflections of the cable, both vertical and horizontal. In many instances the permanent way does not occupy the center of the public road, but runs nearer to the east or the west curbs, the reasons for these deviations being the need to get the greatest lengths of radius for the various curves which the nature of the ground demanded. In its construction the cable road closely resembles the well-known cable road in Chicago, from which it has been copied.

Foundry Addition—Ovens and Pits.

By Thos. D. West.

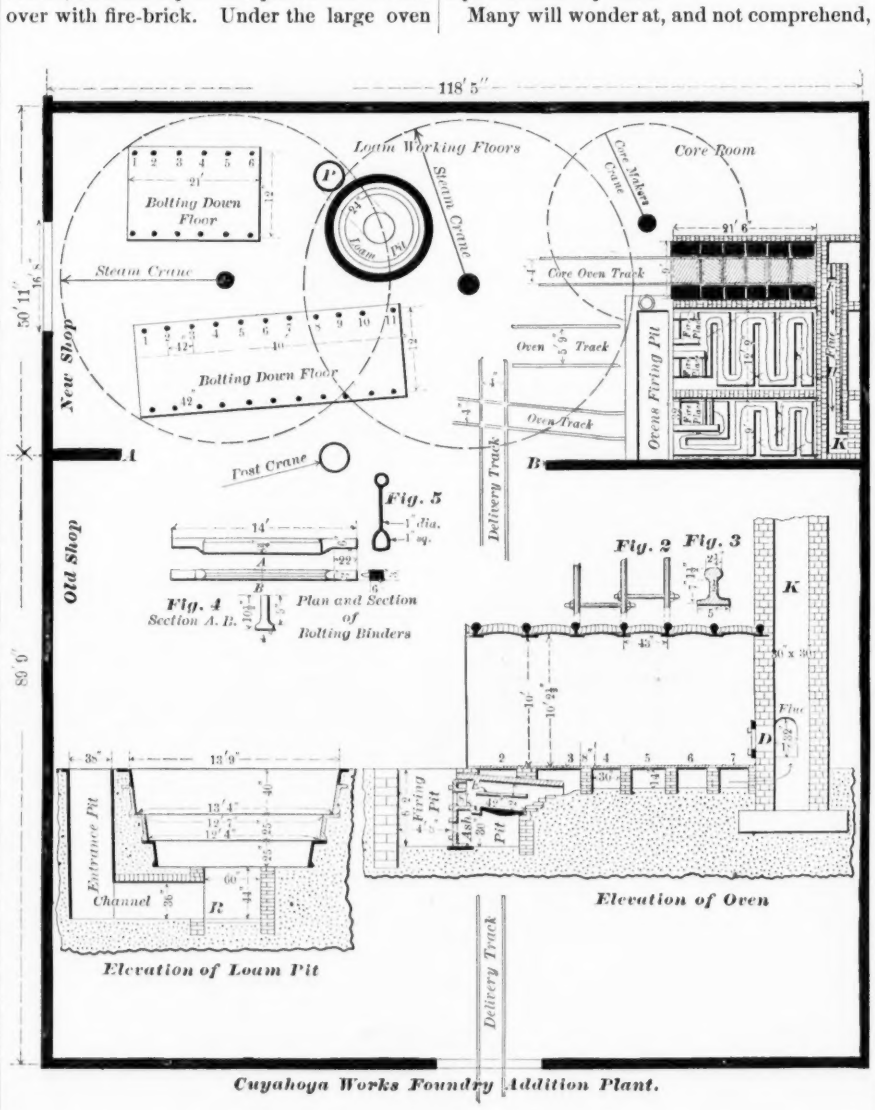
There having been recently built an addition to our foundry (the Cuyahoga Works, Cleveland, O.,) it has occurred to me that a description of the laying out of the ovens, moulding-pits and cranes might interest others and give ideas which would be applicable in other instances. The black border represents the outline of the foundry. The new shop, as shown, is partly divided from the old shop by the partition walls *A B*. In the old shop there are four cranes, two cupolas, brass furnaces, moulding pits, etc. As there is nothing except their antique history that could be set forth to interest the reader, I have omitted showing plans, and devoted the space to showing views of the loam pit, ovens, etc., of the new shop. Credit is due the President of the works, J. F. Holloway, for providing for comfort, and furnishing handy facilities for the new shop, no expense being spared to provide everything requisite in that direction. We have abundance of light and ventilation, steam cranes that rapidly do the moving of heavy loads, excellent moulding pits, and ovens that surpass any I know of for properly drying moulds or cores. Although we use stack or soft coal for the fires, a mould or core will, when dry, be almost as clean as when first put into the oven. Another important feature is that the ovens will dry rapidly, and still not burn a mould or core.

The three ovens, as will be seen, are fired from one pit. The draft flues being at extreme ends of the oven, and the channel for heat to travel being diverted from side to side, there is but a small chance for heat to escape entering through the joints and thickness of the boiler plates up into the oven before it can enter the flue at *F*, *H*, and *K*. The arrow-like lines represent the heat passing from the fires to the flue. The partitions, ×, divert the direction of the heat and also support the covering plates and carriage track. A clearer idea of partitions, etc., may be had from the elevation of the oven at *K*. The covering plates, 2, 3, 4, 5, 6 and 7, are boiler iron ¼″ thick, cut into sections the width of partition centers. As neither of the ovens are partitioned like another, the sizes of plates all differ. The core oven plan is shown having the plates and track laid. As will be seen, the plates upon the outside of the track are free at any time to be lifted, in order to clean out the soot. Were the plates in one continuous piece, the width of oven, then to clean out the ovens under the flues would necessitate the lifting up of the carriage track. Where the fire enters the first flue or partition, the boiler plates are left out, and in their place a cast-iron plate ½″ thick, having prickers 2″ long, and daubed up with fire clay, is used. This is to prevent the direct flame from buckling and burning out the plates.

There are no holes whatever in any of the plates; the heat passing through them and their joints, which, of course, are not air-tight, heats up the oven. Were there holes in the plates they would seriously injure the draft of the under flues, and also let much smoke into the ovens, thereby destroying essential points to be overcome in using slack for firing. To be able to fire with slack or soft coal, and still keep moulds and cores free from soot, is something that will be appreciated by all moulders and core-makers that work around ovens. Not only does soot make everything look dirty, but it is more or less productive of rough castings.

Another arrangement which I doubt being found in any other foundry oven, is that for consuming the smoke. Upon each side of the fire places, about on a level with the fire, are ⅜″ openings, seen at *E*, in elevation. To admit air to these openings there are channels leading from the outer fronts. In the rear of these openings the brick is left open about 4″x6″, running the entire length of fire place. This opening gives a reservoir in which the air becomes heated before being drawn into the fire. This is, I believe, claimed to be beneficial in assisting smoke burning or combustion.

The grate surface for the fires contains an area equal to about 32″x38″. The fire places are all faced with one thickness of fire-bricks, and the top of fire places are arched over with fire-brick. Under the large oven



Cuyahoga Works Foundry Addition Plant.

are two fire places. The one nearest core oven is used for heating the same, and is so constructed, with damper arrangement, that should an extra heat be required in the large oven, both of the fires can be turned on to it. As shown at *D*, in elevation of oven, each oven has a small man-hole door whereby the flue leading to the chimney *K* can readily be cleaned.

The top of the ovens are covered with a series of arches. Fig. 2 shows how the wrought-iron girders, Fig. 3, are held together. For the two small ovens two rows of bolts are used; for large oven, three rows. Upon the tops of these ovens we store and keep shop tools, etc. The way the tops are formed tons of weight can be laid upon them and do no harm, and the combined area of the tops makes a splendid storeroom for systematically keeping foundry tools. Altogether the ovens are a success, and a credit to their designer, Mr. Holloway.

The loam pit shown is made up of four cast-iron rings, the thickness of rim being 1⅜″. The castings were made from a segment about 24″ long. The rings have a taper of 1½″ to the foot, and when together form steps, as shown. These steps are very handy for building staging upon, or standing on, and in getting in and out of the pit. When moulds are so small as not to sufficiently fill the pit we ram them up in curbing, the mould, of course, being in the pit. When such moulds are cast and ready to be taken out, they can be hoisted out altogether, or a few of the bolts are loosened, and the curbing hoisted up. This leaves the sand free to be shoveled up, and castings taken out. Were the mould sufficiently large to fill the pit, the sand rammed between the mould and cast rings would then, of course, require to be shoveled or dug out. In such a case the benefit of the taper of the pit is seen. The taper allows the shovel to free the sand much easier than were the pit straight. When the pit has been dug down to about half its depth, if the mould and casting is not exceptionally heavy, the two cranes can be hitched on and the whole hoisted out without further digging.

Making the pits with cast iron rings provides something solid and reliable; which is as cheap if not cheaper than any of the other styles commonly used.

Many will wonder at, and not comprehend, the use of the entrance pit shown For many shops there is no call for such an under entrance, and again there are many shops where it would be found very useful. An under entrance, such as shown, is an excellent vent channel for safely venting moulds similar to cylinders, etc., having heads cast on. Not only with us is this channel handy for carrying off vents, but it is a necessity on account of the shops' old established custom of making cylinders, the plan of which is shown in American Machinist of September 8, 1883, and March 22, 1884.

As will be noticed the pit is entirely under the swing of one crane; the other crane reaches to about its center. The location of the pit gives us all the advantages possible; in fact the plan of everything was well studied in order to utilize every part of the shop and make it as handy as practicable. The pit is out of the way of the green sand moulders, and the loam moulds can, without any changing of cranes, be taken off the oven carriages and lowered into any portion of the pit, and if it is needed the mould can be poured with two crane ladles.

The plan of the core maker's portion of shop, is one which would be hard to equal for heavy work, being handy and out of everybody's way. The oven is right at the core maker's hand, and he has a crane he can use at any moment.

The loam moulders work under the same crane that loads the oven carriages, and in a portion of the shop where they are not interfered with by any other class of work.

The green sand bolting down floors, are, I think, showed plain enough not to require discription.

Fig. 4 gives the dimension of the binders laid in the bottom of bolting down floors. The dots shown and numbered 1, 2, 3, 4 and etc., locate the distances of the bolting hooks, shown in Fig. 5. The square end fits the binders, and the round eye is the end into which screw hooks are hitched when bolting down a cope. The top of the hooks, Fig. 5, come up within three or four inches of the top of moulding floor. From the top of floor down to top of planks upon bottom binders, will average eight feet. The half of longest bolting down floor, towards the ovens, is over nine feet deep. This gives us a good chance to sink bottom parts of moulds made of loam, upon which green sand is made to form the upper portion. This is a much practiced custom with us in making deep green sand moulds, as it prevents bottom straining.

The delivery track conveys the iron from cupola up to the cranes, and takes the casting out to the yard crane. One car answers both purposes, and as the subject is of interest, it will be shown in another article.

It is to be understood that this plant is not given as a model to construct from, but simply as illustrative of ideas that in some way may be of value in helping to locate shop tools to the best advantage, and also aid in getting foundry builders to learn that the day has passed for them to think "any thing is good enough for a foundry."

Another Fast Train.

A recent dispatch to the *New York Times* says: "The special newspaper train over the Baltimore and Ohio Road, conveying the Washington correspondents from the convention, left Chicago at 2:10 P. M. Saturday (or 3:10 Eastern time) and arrived here at 2 o'clock Sunday afternoon, making the run of 813 miles in 23 hours, while the actual running time was but 19 hours and 30 minutes. The time of the special from Chicago to Chicago Junction—273 miles—was 6 hours and 30 minutes; actual running time 5 hours 35 minutes, an average rate of upward of 52 miles an hour, an unprecedented run for the distance. At one time 57 miles were accomplished in 59 minutes, and frequently single miles in from 56 to 58 seconds. The final 27 miles, from Barnesville to the Ohio River, was made in 28 minutes, and 6 miles of the distance was run in 4 minutes, or at the rate of 90 miles an hour. The 463 miles from Chicago to the Ohio was run in 11 hours and 20 minutes, including 38 stops. Actual running time 9 hours and 20 minutes, or the unparalleled average for the distance of fully 50 miles per hour. From the river to Washington the run was an excellent one, but no special effort was made other than to bring the entire run within 23 hours until Washington Junction was reached, when the engineer was instructed to run the last 44 miles at the rate of a mile a minute. He exceeded the limit by half a minute, and ran the last 16¾ miles in 14 minutes, the 44 miles in 43 minutes 30 seconds."

That is an excellent run, and shows what our first-class roads can do in the way of running light trains with the existing form of locomotive. The writer of the paragraph seems, however, to be a little lame in his arithmetic. Running 273 miles in 5 hours 35 minutes does not average quite 49 miles an hour, instead of 52, as stated; and 463 miles in 9 hours and 20 minutes is under 50 miles an hour. The whole 813 miles run in 19½ hours gives an average of over 41 miles an hour, which is remarkably good speed considering the long distance traversed. From considerable experience of noting the time of fast trains, we are disposed to accept the run of 6 miles in 4 minutes with a grain of allowance. Unless a man is using a stop watch, it is surprising the favorable errors that creep in while noting running time.

A New Tramway Locomotive.

In a recent issue, *Engineering* illustrates and describes a new tramway locomotive, designed by N. Scott Russell, a well-known engineer.

The small engine exhibits some novel features. The boiler shell is welded in one piece. The cylinders and valve motion are of an ordinary high-pressure pattern, but the steam is exhausted into a surface air condenser composed of 250 very thin copper tubes fixed in thin cast brass chambers. From this condenser any steam remaining uncondensed passes to a water tank in the front end of the engine, or into the smoke box, where it passes out free from noise. The speed regulating and brake mechanism are particularly effective, these matters having received special attention, to enable the tramway car to be operated safely on steep grades. A supplementary wheel placed between the drivers, and running on the rail, operates a speed governor and restrains the car velocity below ten miles an hour. All the machinery is carefully enveloped in casing, to exclude dust and grit from the wearing surfaces.

Flues Over the Tops of Boilers.

The following from the *Locomotive* is worthy of extended circulation:

"We are sorry to see that relics of barbarism still exist in the form of flues running over the tops of boiler shells. One would naturally suppose, that when the number of boilers that have been ruined, and the still greater number that have been seriously injured by this form of setting, is taken into account, no one would think of setting new boilers in this manner. Yet it is done every day, and by intelligent and experienced men, too. The argument used in its favor, that the passage of the hot gases over the steam space superheats the steam, and thereby renders it more economical, is a plausible one, and doubtless leads many steam-users to adopt this form of setting, but if the circumstances are carefully examined, the argument will be seen to be fallacious. It will be found impossible to superheat steam when it is in intimate contact with such a large surface and body of water as it is in the case of a tubular boiler. Morever, it will be difficult for any one who has in mind the poor conductivity of *ashes*, to see (when looking into one of these flues after it has been running a few months) how superheating of the steam *can* occur. Our experience with this form of setting (and it is a somewhat extensive one) points to this: So long as the brick work at the sides of the boiler is perfectly intact, so as to *compel* all the gases of combustion to pass through the tubes before they reach the top of the boiler, and the water is good, the influence of the flue is *nil*, because if the boiler is properly proportioned, the temperature in the flue cannot much exceed that of the steam in the boiler, and if the boiler is badly proportioned, the deposit of ashes which soon collects on top of the shell protects it, in a great measure, and this very protection is sufficient to prevent any superheating of the steam. But as soon as the side walls begin to heave, as they almost always do, and crowd away from the boiler shell, *then* the fire takes a short cut up past the side of the boiler into the flue, the draft is sufficient to carry away the ashes at the points where the openings are, and the exposed portion of the shell gets 'scorched.' Sometimes, when the feed-water is very acid, the overheating, while hardly violent enough to burn the plates, is just sufficient to bake all scum on the surface of the water on to the shell above the water-line, beneath which coating corrosion goes on with surprising rapidity. We have seen boilers set in this way, with a coating several inches thick above the water-line, after they had run only a year, beneath which the plates were eaten nearly half-way through, while other boilers in the same room had been running under the same circumstances, with the single exception that the flue did *not* pass back over the shell, for upwards of fifteen years, and only showed very slight traces of this action. This seems to us to be conclusive evidence of the injurious action of this form of setting, aside from the liability, at any time, of the side walls becoming so badly disarranged that actual overheating and fracture therefrom may occur."

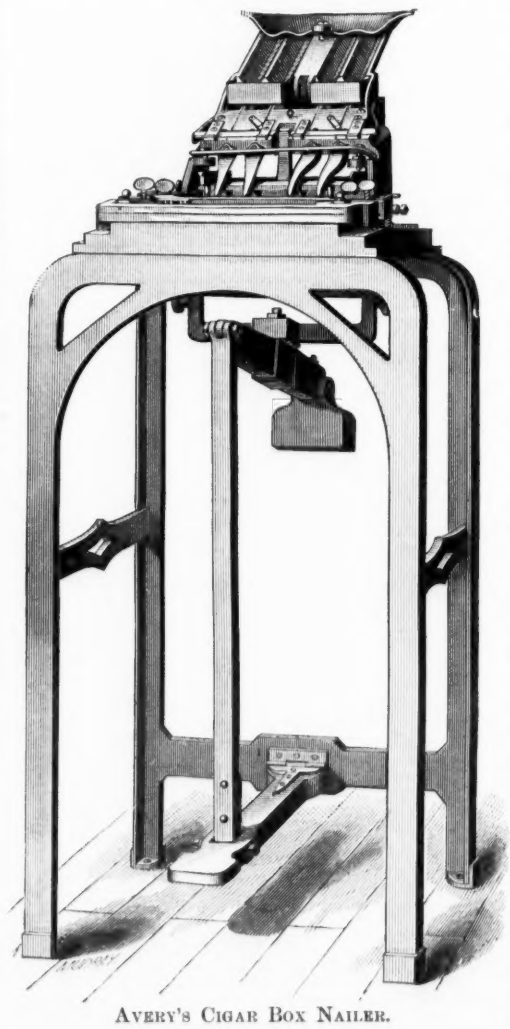
The Nathan "Invincible" Pump.

On this page we show a cut of a new hand pump introduced by the Nathan Manufacturing Company, 92 Liberty Street, New York, which appears likely to receive wide application in offices and places where a strong noiseless pump is desirable. This pump works by a combination of the vacuum and force principles. The handle moves the shell which is cylindrical, and its vibrations produce the act of pumping. The cylinder is divided vertically by a partition which divides in the middle. Moving the handle increases the size of one chamber and decreases the size of the other. Its action is like opening and closing a book that can double back. The increasing chamber draws in the water by creating a vacuum and the decreasing chamber forces the water out by displacement. This arrangement makes the pump double acting, so that it throws a strong continuous stream. All the parts are made interchangeable like all the fittings made by this firm.

THE NATHAN "INVINCIBLE" PUMP.

Dr. Avery's Cigar Box Machinery.

The making of cigar boxes would not seem to be a field for the display of many mechanical improvements, but an examination of the various machines used in connection with the business, as carried on by Dr. Samuel Avery, of Phoenix, N. Y., shows that mechanism can be used to facilitate work in this business as well as in any other.



AVERY'S CIGAR BOX NAILER.

The first of the machines at his works is a special cut-off saw for cross-cutting the lumber, which drops off pieces at the rate of 120 per minute, landing them on an elevating belt that carries them to the next story.

The peculiarity of the saw action is that it travels through the piece, drops down, and comes back below the level of the table, raises up and goes through above the table, cutting the piece as it goes forward, all these operations being brought about by a single crank motion; a very pretty mechanical movement, but one not readily described without engravings.

The next machine is the box nailer, of which a cut is given. The operation of this machine is in effect as follows: The wire nails used for the work are scattered in the V-shaped channels at the upper end of the inclined casting, seen at the top of the cut. Along the bottom of each of these channels is a slot, just wide enough to admit the body of the nail, but not wide enough to allow the head to pass through. When the nails are thrown into these V channels a large proportion of them fall into the grooves and hang by their heads, and, owing to the inclination of the table, slide down in line the same as screws in the ordinary wood screw machinery. Such of the nails as do not fall into the grooves, drop through openings into a till below.

By this machine, four or any less number of nails may be driven at once. Nails in the grooves not to be used are stopped by a spring device.

By the movement of the foot treadle, the lower nail from each row is released and allowed to fall into one of the curved spouts leading to the driving guides, which are simply V-grooved castings that can be set for different positions; the hammers are simply pieces of triangular steel dropped into these same grooves.

The pieces of wood which are to form the end of the box are laid flat upon the table, the ends coming against an adjustable stop at one side. The pressing down of the foot lever drives what nails are in the channels into two pieces which form the corner of the box, and prepare another set of nails for the next corner.

After nailing a hundred or two ends or sides together, the two pairs are taken and nailed together, forming the hoop upon which the bottom is nailed by the same machine, or, as it is the case in large factories, by another machine. Special devices are arranged whereby bottoms wider than necessary may be nailed on with either one or both edges projecting, and what are called "drop cover" boxes are nailed with the same facility as the plain sort. Special ingenuity has been displayed in devising ready adjustable devices to fit all conceivable cases. By the special trimming saws used, the projecting edges and ends of bottoms or sides are trimmed perfectly even with the rest of the box, regardless of the extent of the projection, with lightning speed.

The sand wheel is both a novelty and a success for the business. It consists of the usual revolving disk, upon which sheets of sand paper are held, and in this case the holding device is simply buttons. But the machine is also a suction fan and a blower in itself, having wings cast on the back of the disk, forming a suction to draw away the dust and blow it out through a pipe, thus performing triple duty. The machines each perform their work in a simple and efficient manner, and with the nailer we have described boxes are nailed at the rate of two thousand per day.

We saw a young woman in the shop we visited nail forty corners in one minute, and are informed that she has nailed forty-seven in one minute, and that she also has made one hundred boxes with covers in thirty minutes. Women are employed in this work, because, we are informed, they nail faster than men, and the operations are so simple and so easily performed that a child ten years old is competent to attend to them.

New Revenue Steamer.

A new revenue steamer, called the Perry, has recently been built by the Union Dry Dock Company, Buffalo, N. Y., for use on the great lakes. On the trial trip the vessel maintained a speed of fifteen miles an hour. The hull of the ship was designed by Captain Geo. R. Slicer, Superintendent of Construction United States Revenue Marine; and the machinery was designed by Chas. E. Emery, Consulting Engineer United States Revenue Marine. The hull is 161 feet long, 25 feet beam, 9 feet draft, and has a displacement of 451 tons.

The engine is of the ordinary vertical type, with cylinder 38 inches diameter, and 40 inches stroke. There are independent main and cut-off valves at each end of the cylinder, reducing clearance to a minimum. The link motion is operated by a reversing engine. The boiler is the ordinary flue and return tube marine type, 17 feet long, 12′ 9″ wide on the front, with circular shell 11′ 6″ in diameter, provided with steam chimney 7′ 3″ diameter. The boiler on trial readily maintained 50 pounds of steam, while the engines made 84 revolutions per minute. The contractors have performed their work very creditably, and the vessel is a very satisfactory type of a modern revenue cutter. The main shaft is 9½ inches in diameter. The screw propeller is four-bladed, 10 feet in diameter, with pitch expanding from 15½ feet to 17½ feet.

The engines belonging to the new cruisers, the Chicago and the Boston, are well advanced in the Morgan Works, New York. One set of the engines are being erected on the floor of the erecting shop and the others are nearly ready for fitting up. Several changes in the details have been made since the engines were designed.

A great many machine shops have started on a small scale. In some instances the proprietor has himself been "boss and all hands." In still other instances he has hired a boy or a man to assist him. A good engine lathe makes a very fair equipment at the outset. Quite a number of shops that have been started in this small way have become gradually enlarged, until they have attained high rank among the machine industries of the country. Generally, however, the men who have started shops on the diminutive plan have been too modest to promise much at first. A little self-assurance, however, is useful at times. The following item, taken from an Ellsworth, Me., paper, presents an example of a small shop starting with great promise:

Messrs. Bonsey & Murch, Ellsworth, have recently purchased and set up a machine lathe in the pump and block factory of Mr. H. L. Murch, on Water Street, and are prepared to do all kinds of machine work, both old and new, in connection with their other business. They have secured the services of Mr. William Small, a thorough machinist, and work entrusted to his care cannot fail to be satisfactory.

Competent railroad men estimate the loss to the various lines in Texas incurred during the recent floods at $3,000,000.

The Wabash, the Reading, and the West Shore railroads have recently gone into the hands of receivers. In each case the action was taken in a friendly way to protect the interests of stock and bond holders. The West Shore is not yet fully built and equipped. When it is made ready for the traffic it was built to accommodate there will be fair prospects of securing satisfactory returns upon the large capital invested.

LETTERS FROM PRACTICAL MEN.

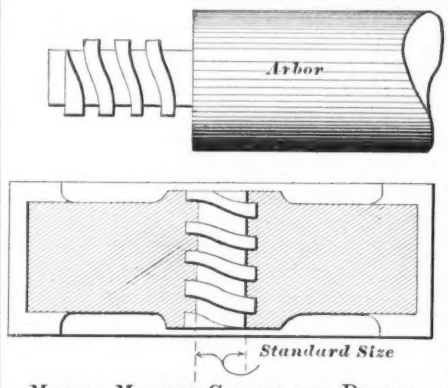
Milling Machine Cutter for Double Duty.

Editor American Machinist:

What has become of John Grant and his articles on the milling machine? The subject cannot be on the verge of exhaustion. I send you a little hint, to assist in keeping the subject open. It relates to making milling cutters that may be used either on an arbor, in the ordinary way, or as end mills. Referring to the sketch: Bore the mill standard size for arbor, then thread with coarse pitch square thread, and it is done. The key-way can be cut as if not threaded, for use on an arbor between collars, and it is also ready to screw on an arbor, for use as an end mill.

C. E. LIPE.

Syracuse, N. Y.



MILLING MACHINE CUTTERS FOR DOUBLE DUTY.

One Answer to a Practical Question.

Editor American Machinist:

The discussion between Messrs. Baldwin and Corbin is evidently an outcome of the recent explosion at Gouverneur, and though it might be impossible to find two boilers connected exactly like the two they describe, the general features are common enough. The question, then, simply resolves itself into this: Is it safe to establish a free communication between boilers of different pressures? My experience tells me that it is.

If one boiler is cold and there is no fire in the furnace, it would probably be injurious to this boiler to have the steam connection opened, as the shell about the steam space and the surface of the water would be heated to a high temperature while the bottom of the boiler would remain cold, thereby producing a very unequal expansion and consequent strain.

In this connection I may say that I have seen an upright boiler with a poor circulation have a pressure of fifty pounds, indicated by the steam gauge, and the water in the water leg be only 65° F. by actual measurement.

But, to return to the question in hand, I have repeatedly, and without any apparent damage to the boiler, opened the steam passage between boilers under the conditions named; that is, a high pressure in one boiler and a low one in its mate, with a brisk fire in both furnaces. However, I did not at first open the valve to its full extent, but enough to allow a sharp stream to pass, increasing the opening as the pressure in the two boilers approached uniformity. I have always thought that if the valve were suddenly thrown open, the violent entrance of the steam at a high velocity would be apt to produce an increase of pressure partaking of the nature of a concussion, which, together with the resulting local increase of temperature, would undoubtedly produce very injurious results. But when opened, as I have said, I have carefully observed the varying conditions of the increasing pressure, and could detect no variation from the usual changes resulting from raising steam in the ordinary way. Yet the increase was due to a great extent to the entering steam, because the time required to reach a certain pressure was much less than a fire alone would demand.

I have also established a steam communication between boilers where one carried 100 lbs. pressure and the water in the other was cold; but in this case the steam pipe entered at the base of the water leg, and was simply used to raise and maintain a pressure that was to be utilized in cases of emergency. This case, of course, is so common that it must be familiar to all.

GEORGE L. FOWLER.

What Caused Wear of Truck Boxes.

Editor American Machinist:

Some time since the writer saw a locomotive in which the front truck boxes were worn in on side of the box, as at the dotted line *A*, Fig. 2 of the engraving, to about three-fourths of an inch. All four boxes were about alike, the hubs of the truck wheels having ground into side of the boxes next to the hubs. The center plate casting was the same as shown in the engraving, Fig. 1. As will be seen there was $\frac{1}{8}$ in. play in the center casting. Was it enough play? Or was that the cause of it grinding so? Several good men have disagreed on the cause. Will Mr. A. Dolbeer, or some of your correspondents point out the cause, with special reference to the amount of play for center plate?

LINK.

Cleveland, Ohio.

Money Value of Steam Boilers.

Editor American Machinist:

The following questions are presented to my mind by the great diversity of action, advice, and opinions of boiler users, and boiler manufacturers, on the subject of steam boilers.

Is there any difference to be obtained, in the economy of fuel, with any of the regular boilers in general use, under equal conditions, and if so, is there enough to warrant the users paying the great difference in price, between the several types of boilers? At the end of over fifty years' general use of many kinds of boilers, the first question may seem out of place, but when we find that fifty horse-power in one type of boiler is sold for one-third less than another, and that a large majority of users in this country buy the cheapest (which is the ordinary return tubular boiler) and buy it because they are told it is as economical as any, by the makers, and costs the least, and moreover, that it is the best in all respects when all things are considered, it is time these questions were solved, in some reliable and satisfactory way. If high cost in boiler, engine, or anything, does not carry returns into the pocket of the buyer and users, sufficient to warrant the outlay, it is a delusion, and the cheaper and simpler things are the best, but I cannot just now think of any cheap or low-priced thing that gives as much result or satisfaction to the buyer and user as something of higher cost.

To return to the boiler subject. In the simplest and cheapest form we have the return tubular boiler, which costs the least per horse-power. This boiler is set in brickwork, and the furnace is really the whole width and length of the space inclosed by the brick walls of the setting and the walls of this entire space are exposed directly to the heat from the fire. The loss from radiation of heat through the walls is *pro rata* to the difference in the temperature between the fire and hot gases, and the surrounding air, and the thickness of the walls, or the efficiency of their protection from this loss.

I will now consider the higher cost boilers, which are all those with internal, or external furnaces, which discharge the heat through the internal heating surfaces first, and thus apply the full heat of the furnace, directly to the internal water-heating surfaces first, and the reduced temperature of the gases, to the external-heating surfaces, and the walls of the setting last. The boilers on this system are the vertical tubular, locomotive, cylindrical internal furnace tubular and flue, the American drop flue, and the English Lancashire and Galloway boilers.

In this system of boilers it will be seen that the major portion of the heat is absorbed by the metal walls of the furnace, and the internal heating surfaces, while the balance is returned beneath the boiler, and applied to the external heating surfaces, being confined by the brick walls. Now, which system will produce the best results from the fuel and outlay for twenty years, and why? Theoretical reasoning, I think, will award the best results to the internal fired boilers, and so will any reliable tests, or experience, under equal conditions; and if there is a difference of only five per cent. in the saving of fuel, in favor of the highest-priced boiler, the difference in price, and the price of a new boiler, will be saved in the life of the boiler, under any equal and comparative conditions as to draft, quality of water, care and duty, *pro rata*, to kind of heating surface. The superiority of economy of fuel is generally conceded to this system of boilers, but the makers and advocates of the return tubular boiler assert that it will do as much work to the fuel, as the other boilers, and if they cannot convince the buyer, and secure his order on this claim, they offer this argument: If you will put the difference in price into a larger return tubular boiler, you will surely get as good a result from the fuel, and outlay as if put into the higher cost boiler.

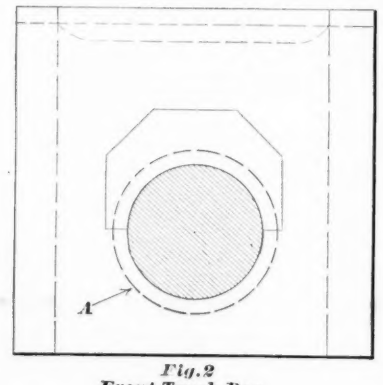
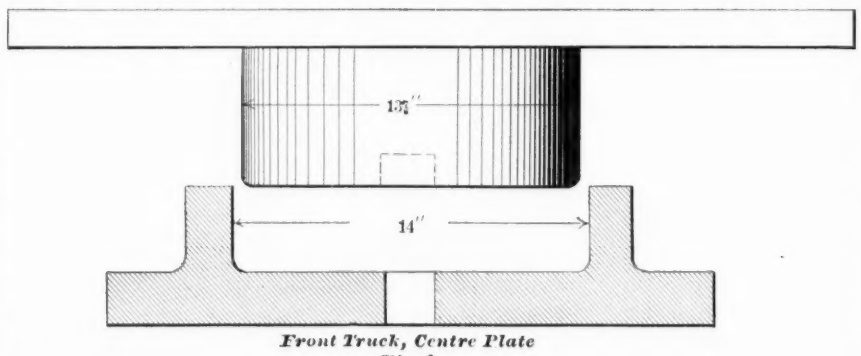


Fig. 2
Front Truck Box



Front Truck, Centre Plate
Fig. 1

Well, suppose this is admitted, and say that fifty horse-power is the capacity of boiler wanted by the buyer. This will cost in a return tubular boiler, say $700, and the lowest cost boiler on the other system $1,000. So we will buy $300 worth more of the return tubular boiler, which will give us 25 horse-power more. Now we have a 75 horse-power boiler doing 50 horse-power. This would be very economical, and would be 33 per cent. in favor of larger boiler, because the other is but 50 horse-power and must do the 50 horse-power while the 75 horse-power does only the 50 horse-power. Now, if the results are equal, and we stop here, and don't care to look for more economy, it is all right and satisfactory, if the party believes he is doing the best he can. Like the one who is robbed not knowing it, he is not robbed at all, but we will try for more saving. So we will put $300 more into the simplest and most desirable of the other type of boiler that will give us 75 horse-power and put it under equal conditions, with the other, then we will have 75 horse-power of each kind, doing 50 horse-power work. Now, if under these equal conditions we can save 5 per cent. over the return tubular boiler, we shall come out as follows: 50 horse-power, constant for 10 hours, with a 75 horse-power return tubular boiler, will require not less than 4½ lbs. of coal per horse-power per hour, including waste in handling, banking fires, over night, or kindling new fire every morning. This would be 2250 lbs. per day of 10 hours, and for 20 years at 300 days per year, will be 6,000 days consumption of 2250 lbs. of coal, which is 13,500,000 lbs. which at ¼ ct. per lb. is $33,750, and 5 per, cent of this is $1687 saved at 5 per cent., and as the boiler cost $1300 it will be seen that there is enough saved to buy the new boiler, and pay the interest on the difference in price paid, and have something left for a less saving than 5 per cent. But a 5 per cent. saving is sure to be obtained, under these conditions, and more, I believe, because there is a saving of the difference in radiation through the walls, for reasons stated above, less loss from banked fires, or making new, and while standing, and greater effect of the fuel laying in contact with the iron walls of the furnace.

To offset all these reasonable claims, for the internal fired boilers, it may be claimed, that the combustion of the fuel would be better in the return tubular boiler than in the others, but this is doubtful, because of the short run to the tubes in the tubular, in which very little combustion takes place, but if in the other type of boiler there are large flues, combustion may be maintained entirely through them, and continued beneath the boiler, also, if the boiler has tubes, with suitable combustion chamber, the combustion would be as good as in the return tubular boiler, so that the probability is that there would be 8 to 10 per cent. saving in favor of the internal fired boiler, either with tubes or flues. This is claimed to be the experience of the great steam users in England and Continental Europe, whose experience and practice we are apt to estimate too lightly, and assume that we know more than they do about the economical production of steam, and tell them that the boiler they have tried, and we adopted, viz., the return tubular, is a better boiler than those they use, and pay so much more for. Their answer is, that when fuel is as dear with us as with them, we shall look deeper into the subject, and learn that they are right and we are wrong, both as to economy of fuel, and cost of maintenance for twenty years of the two types of boilers, as compared with each other. Also that their system of boiler will ultimately come into general use in this country, notwithstanding the great difference in price. This, I think, is likely to take place, as this system of boiler has been made in simple form, and introduced already with good success, and now both the Lancashire and Galloway boilers are being introduced into this country, after keeping their place in England and on the Continent for 40 years, against all others.

OBSERVER.

Why Stove Moulders' Wages are Reduced.

The following press dispatch, dated Pittsburgh, June 10th, appears in several daily newspapers:

"The stove manufacturers of the two cities, with the exception of A. Bradley & Co., are preparing to start their foundries with non-union men, in order to enforce a reduction of 20 per cent. in wages. The occasion of the reduction was the action of Perry & Co., who had the prison contract in Sing Sing, New York, and through that advantage compelled Troy founders to cut wages. The Western founders have had to follow the decrease or, as they assert, lose their trade. Perry & Co., get contract labor at 65 cents a day, have their plant from the State of New York free of rent and taxes, and are enabled to unload foreign pig from vessels at their foundry door. Through these advantages they have long been the rulers of the stove and hollow ware business."

A recent *improvement* in boilers contemplates heating the air for the furnace around the steam dome.

Constitution of a Shop Mutual Benefit Association.

We have often referred to mutual benefit associations among the workmen in machine shops, and have published the constitutions of two or three such associations. Below we publish the constitution of the Yale & Towne Mutual Benefit Society of Stamford, Conn. Its provisions are acceptable to its members, and the society is a success. Every large machine works should have a mutual benefit association.

ARTICLE I.—NAME.

The name of this Association shall be "The Yale & Towne Mutual Benefit Society."

ARTICLE II.—MEMBERS.

Section 1.—Members shall be of two classes: regular, persons twenty-one years of age and over, and junior, persons under twenty-one years of age. But any person under twenty-one years of age may be enrolled as a regular member by the payment of the initiation fees and dues of that class.

Sec. 2.—Any officer or employe of The Yale & Towne Mfg. Co., who has been in the employ of the company one month, and has been approved by the Executive Committee, may become a member upon signing an application agreeing to comply with the rules of the society and upon the payment of an initiation fee of one dollar for a regular member and fifty cents for a junior member.

Sec. 3.—All applications for membership must be in writing, upon the form provided for the purpose, and be presented to the secretary not later than the fifteenth of any month. Membership shall date from the first of the month next after the date of application.

Sec. 4.—Membership shall cease upon the death or resignation of a member, upon his removal from Stamford, if not in the employ of The Yale & Towne Mfg. Co., or upon his neglecting to pay the monthly dues for three months.

ARTICLE III.—MEETINGS AND OFFICERS.

Sec. 1.—The annual meeting of this society shall be held on the third Tuesday of March, the regular meetings on the third Tuesdays of June, September and December, and the fiscal year shall end on the 28th day of February of each year.

Sec. 2.—A special meeting may be called by the president at any time, and shall be called by him upon the written application of the Executive Committee or of any ten regular members of the society.

Sec. 3.—Ten members shall constitute a quorum, at any meeting of the society.

Sec. 4.—The officers shall be, a president, vice-president, secretary, and treasurer, who with five directors shall constitute the Executive Committee.

Sec. 5.—The officers and directors shall be elected by ballot at the annual meeting to serve for the ensuing year.

Sec. 6.—In case of the death, resignation or removal from membership of any officer or director, the Executive Committee may elect another to fill his place until the next annual meeting.

Sec. 7.—Notices of all meetings of the society shall be given by posting them upon the bulletin board of the society, in the gatekeeper's room of The Yale & Towne Mfg. Co., at least one week before the date of the meeting.

ARTICLE IV.—EXECUTIVE COMMITTEE.

Sec. 1.—The Executive Committee shall have general supervision and charge of the affairs of the Society, and shall meet statedly upon the third Saturday of each month, and may meet at such other times as it may appoint.

Sec. 2.—The Executive Committee may make by-laws to govern its transactions.

ARTICLE V.—DUTIES OF OFFICERS.

Sec. 1.—The president, and in his absence the vice-president, shall preside at all meetings of the society, and of the Executive Committee, and perform such other duties as may belong to his office or be provided for by this constitution.

Sec. 2.—The secretary shall keep minutes of all transactions of the society, and of the Executive Committee, and shall attend to all correspondence, and such other duties as the by-laws may prescribe.

Sec. 3.—The treasurer shall receive all moneys paid in to the society, and shall pay them out only upon written orders signed by the president and secretary; shall deposit in bank or invest the funds of the society under the direction of the Executive Committee, and shall make a detailed report for the fiscal year, at the annual meeting, to be printed and sent to each member, and shall also perform such other duties as the by-laws may prescribe.

Sec. 4.—All moneys deposited in bank, or invested in any way, shall be withdrawn only upon the signature of the treasurer, countersigned by the president and secretary.

ARTICLE VI.—DUES.

Sec. 1.—The monthly dues shall be fifty cents for each regular and twenty-five cents for each junior member, payable in advance, and will be collected by the paymaster of The Yale & Towne Mfg. Co. on the first of each month from the amounts due by the company to the members of this society, and shall be paid over by him on or before the third of each month to the treasurer of the society.

Sec. 2.—Whenever any member is receiving benefits from the society on the first of any month, the amount of his monthly dues shall not be deducted by the paymaster.

Sec. 3.—In case the amount due to any member by the Yale & Towne Mfg. Co. upon the first of any month, is not sufficient to pay his monthly dues, or in case a person shall continue a member after he has ceased to receive pay from the said company, such persons, if desirous of continuing their memberships, shall pay their dues directly to the treasurer of the society.

ARTICLE VII.—BENEFITS.

Sec. 1.—Any member unable to work in consequence of sickness or injuries, except those resulting from drunkenness or other immoral conduct, shall, upon presenting a certificate from a reputable physician upon a form provided by the society, receive, if a regular member, at the rate of five dollars per week, or fractional part thereof, and if a junior two and a half dollars per week, during sickness or inability to work, provided that no member who is in arrears for dues for one month, at the time of his quitting work on account of said sickness or inability, shall be entitled to receive benefits, but no member's benefits shall begin more than one week anterior to his being reported sick.

Sec. 2.—No member shall receive benefits until after he has made his second monthly payment of dues, nor during the first week of any sickness. But in case his inability to work on account of sickness or injuries shall continue more than one week, he will be entitled to benefits from the date of the beginning of his sickness.

Sec. 3.—Any member upon being injured or taken sick, and desiring to avail himself of the benefits, shall notify at once the president of the society.

Sec. 4.—The Executive Committee shall at each stated quarterly meeting of the committee elect twenty-four members as a Visiting Committee, who shall serve until the next quarterly meeting, or until others are elected. The president, upon receiving notice of any sick member, shall select three names from the Visiting Committee and shall notify them of the case, and it will be their duty to visit the member every week as long as he may be an applicant for benefits, and to make a weekly report of his condition to the secretary upon a blank form provided for the purpose. Such report to be signed by at least two members of said sub-committee.

Sec. 5.—Upon receiving each report from the Visiting Committee, duly executed, the president and secretary shall make draft upon the treasurer for the amount of each weekly benefit.

Sec. 6.—Within three days after the death of any member of the society shall have been duly certified, the treasurer shall, upon order of the president and secretary, pay to his heirs fifty dollars, in case the decedent be a regular, or twenty-five dollars if he be a junior member, provided the said member shall not be in arrears for one month's dues at the time of his death.

ARTICLE VIII.—MEMBERS NOT IN THE EMPLOYMENT OF THE Y. & T. MFG. CO.

Sec. 1.—Any member of the society who ceases to be in the employment of The Yale & Towne Mfg. Co. may, at the discretion of the Executive Committee, remain a member of the society, during ten weeks absolutely, or, if he continues to reside in the town of Stamford, for an indefinite period, provided he continues to punctually pay his monthly dues.

Sec. 2.—Temporary suspension from work will not be considered as ceasing to be in the employ of the company, if it does not extend over ten weeks.

ARTICLE IX.—RETURN OF SURPLUS.

The funds of the society shall be allowed to grow until they amount to five hundred dollars. If at the end of any fiscal year they exceed five hundred dollars, the surplus above that amount may be divided among the members of the society by a vote of the annual meeting, provided the fund shall not thereby be reduced below five hundred dollars, or below two dollars per member, if there should be more than two hundred and fifty members. Such division shall be made pro rata to each member in good standing at the date of the annual meeting, upon the basis of the total amount he shall have paid in during the year just closed, less the amount of benefits he shall have received during the same period.

ARTICLE X.—CLAIMS.

Sec. 1.—All claims of any member against the society shall be limited to the amount of the society's assets in the possession of the treasurer.

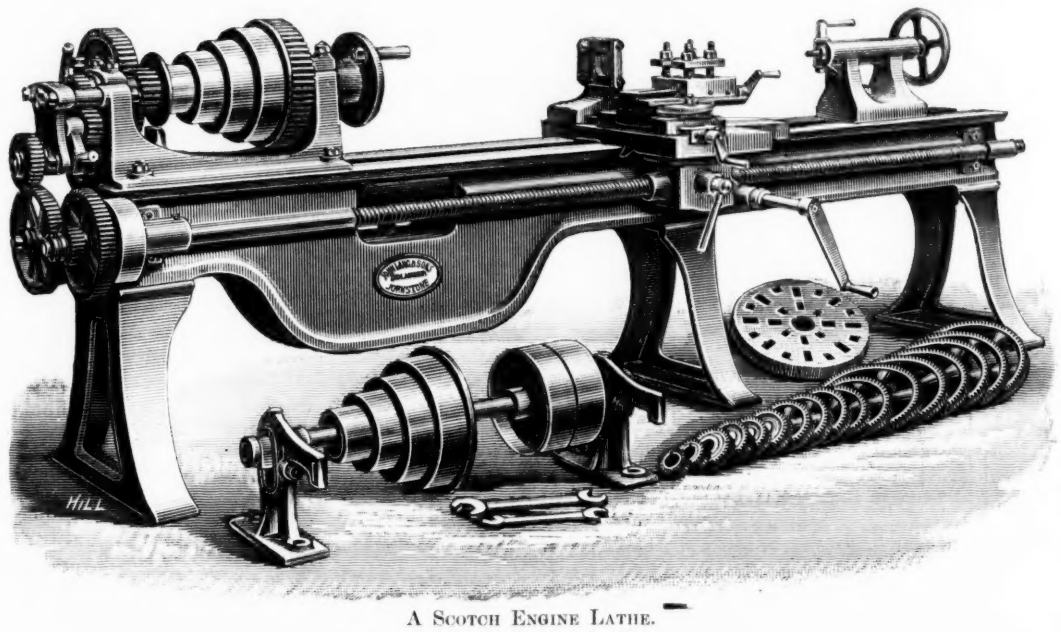
Sec. 2.—No member shall, by reason of his membership, have any claim against the other members of the society, either jointly or severally.

ARTICLE XI.—ALTERATIONS OR ADDITIONS.

Sec. 1.—No alteration or addition shall be made to this constitution, unless at a stated or special meeting of the society called for the purpose, which purpose shall be stated in the call of the meeting; and unless two-thirds of all the members present shall vote in favor of such alteration or addition.

An 8¼" Center Scotch Lathe.

The engraving on this page represents an 8¼" center (16½" swing) screw cutting engine lathe, made by John Lang & Sons, Johnstone, Scotland. It is a strong substantially made machine, with many peculiarities of British made tools, but at the same time with several features of construction more in accordance with American than with British practices.



A SCOTCH ENGINE LATHE.

All sliding parts are fitted by scraping, and the gearing is cut from the solid metal. The gearing is so proportioned as, with the cone changes, to give equal gradations of speed through all the changes—a matter that does not always receive the attention it deserves. The cone is turned inside, so as to be in accurate balance.

The spindle is of steel, and is finished on dead centers in accordance with the best modern practice. It runs in parallel gun-metal boxes. The arrangement for reversing, for cutting right or left hand screws, is on the end of spindle, and is arranged for very convenient operating.

The compound rest has arrangements for conical turning, and large wearing surfaces.

The carriage is hand traversed by rack and pinion, giving quick movement, and is self-acting by means of screw. The leading screw is engaged at top and bottom by double nut.

The lathe is shown with the gap so common in English and Scotch lathes, but is made without if desired.

A full set of change wheels, large face plate, driving stud, an adjustable traversing stay, or rest, overhead driving motion, wrought iron, hardened wrenches (keys), etc., are furnished with the lathe. Every lathe is operated and thoroughly tested before leaving the works.

The price of this lathe, screw-cutting, self-acting by screw, with bed 10 feet long, as shown in the engraving, is $245.00.

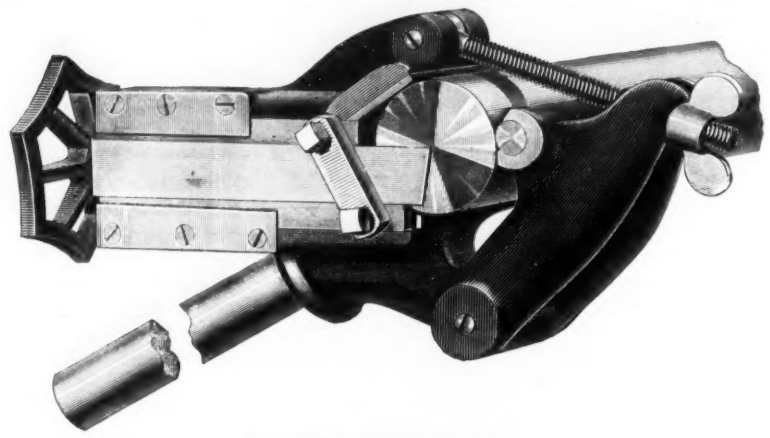
There are indications that Boston and St. Louis will at no distant day begin to invest themselves with the conveniences of elevated railroads. In both cities the cable system of traction has a fair chance of being adopted.

The vast navy of Great Britain is built, equipped, and maintained by royal dockyards, where all work is done under Government management. There are five dockyards, employing in time of peace about 16,000 persons, whose annual pay aggregates about five million dollars. Work done in these yards is of a very high quality, but the impression prevails through the country that the mechanics take twice the time to do their work in that contract shop men would use. About half the men are permanent Government employes, who are entitled to a pension after ten years of service, just the same as men belonging to the belligerent part of the army and navy. The greater part of the mechanics are raised from apprentices, but a small percentage of the men are hired from outside shops.

Elliott's Cutting-Off Tool.

In our issue of July 28, 1883, we illustrated a cutting-off tool for cutting up stock in the lathe up to ½ in. diameter. The accompanying engraving represents a tool upon the same general principle for cutting larger sizes. In this tool the cutter is fed by means of a screw instead of by a lever as in the smaller size. Like the smaller size this may be used in a lathe without either tool post or slide rest. The stock to be cut is grasped loosely between three hardened steel surfaces, the handle resting on the lathe preventing the tool from turning with the stock. Some of the advantages claimed for it are rapid and exact cutting and the facility with which it can be used on any lathe in a shop. We are informed that a blade or cutter $\frac{3}{32}$ in. thick can be forced to its work so as to use all the power of a 20 in. lathe, out of gear, without injury to the cutter.

This tool is made by Sterling Elliott, Newton, Mass.



ELLIOTT'S CUTTING-OFF TOOL.

The Proper Allowance for Shrinkage and Finish in Patterns.

BY I. WHITEHEAD.

The allowance that should be made for shrinkage of castings, and for finishing them, are of the first importance, because they are questions that arise with reference to almost every pattern or casting made. The adoption of a shrink rule seems to dispose of the question of shrinkage in the minds of most pattern-makers, and when in certain cases the allowance does not prove correct, they will still stand behind their rule, considering themselves responsible no further. To be a good mechanic consists chiefly in the ability to judge correctly upon all the questions which arise in a trade—this being the mental part; while the physical is secondary, especially so in this age of machinery. The difficulty of the question is acknowledged, but that is no reason that we should shirk it, but rather that we should not allow it to rest, but by close observation and experience gain all the light we can upon it. The allowance necessary for shrinkage varies for different kind of metals, and the different conditions under which they were cast. For castings where the thickness runs about 1″, cast under ordinary conditions, the following allowances can be made:

For cast iron, $\frac{1}{10}$″ per foot,
" brass, $\frac{3}{16}$″ "
" steel, $\frac{1}{4}$″ "
" mal. iron, $\frac{1}{8}$″ "

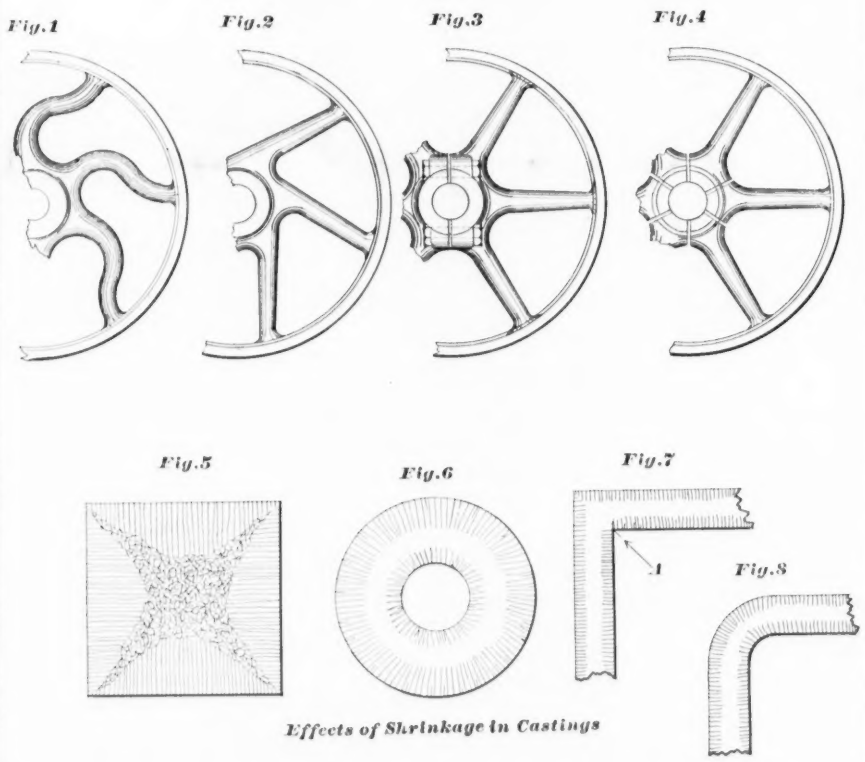
Thicker castings, under the same conditions, will shrink less, and thinner ones more, than this standard. The quality of the iron, and the manner of moulding and cooling, will also make a difference. Where there is a large range of work, the shrink rule is often discarded, and the judgment and experience of the pattern-maker substituted.

When heavy and light parts occur in one casting, it will cause unequal shrinkage, which will crack the casting or draw it out of shape, or weaken it by the unequal strains existing within itself. A good illustration of this is found in a pulley with straight arms. The rim, arms, and hub must be so proportioned that they will shrink alike, and in the same time, and yet contain the varied strength required to perform the work of a pulley. If the rim is light and the arms heavy, the rim will shrink more than the arms, which will be likely to crack the rim, while if the arms are light and the rim heavy, the arms will crack. When the hub is heavy in proportion to the arms and rim, it will remain hot longer, and continue to shrink after the rest is set, thus creating a strain, drawing the arms from the rim, which is sometimes so great as to crack the arms, or that a slight tap with a hammer, in addition to the strain, will break them. To overcome these strains the hub is sometimes bared and the core drawn, so as to cool it off quicker. To avoid these internal strains in a pulley casting, various devices are adopted, which will give an idea of how to overcome strains in other castings as well. First, we have the curved arm, as shown in Fig. 1, also the arm set at angle to the radius, as in Fig. 2. Both these devices act on the principle of drawing the hub round as it cools, and thus, to a great extent, relieving itself of the strain.

Sometimes the hub is split in two parts, as shown in Fig. 3, by cores or plates, first forming lugs upon the hub so as to bolt it together again when cast. If the cores cut it entirely in two then the pulley is often fixed to the shaft without key or set-screw, by using the hub as a clamp.

Another method is to set cores between each arm, as shown in Fig. 4, afterward tying them together by a wrought iron band on each side of the hub, and running bab bitt metal in the space by the cores.

Similar internal strains exist in all castings, and are sources of weakness, a study of which is very essential to safety and economy. From the nature of the shrinkage in metals much strength can be gained, as to avoid unequal strains from shrinkage as much as possible. You will see from these conditions that the designer, pattern-maker and moulder are inseparable partners to the production of good and correct castings. It is also evident that size or weight is not strength, nor the lowest first cost economy. The amount of intelligence and experience put into the work becomes the greatest factor in economy.



Effects of Shrinkage in Castings

ALLOWANCE FOR FINISH.

For the parts of a casting that are to be finished, allowance must be made in the pattern of the amount necessary to true it up, which depends upon the liability of imperfection in the shape of the casting. It must also be so moulded that the metal shall be clean and sound in the places to be finished. To this end such parts should be arranged to be cast down, or in the position in the mould where the metal receives the greatest pressure first, thus floating the impurities in the metal away from these parts. When the whole surface of a casting is finished, extra finish is allowed on the top side of the mould and the rest is left to the moulder, who uses skimming gates and extra clean mould, and sometimes a rising head, thus adding a pressure or feed to the precaution of cleanliness.

VARNISHING PATTERNS.

To insure the special treatment which is necessary to the different parts of the mould, I advocate varnishing with different colors. For example, for the parts that are to be finished or brightened, use clear or yellow varnish; for core prints, red; and for unfinished iron use lampblack in the varnish. It is very little more work, and it carries its own information. By this means the moulder can see at a glance the parts which require to be clean, where he can use blacking, and the best place to take off the air.

The same advantage results from a similar treatment of the core-boxes, and for the same reasons. In a word, the moulder can work more intelligently.

Learning at the Fountain Head.

The British Royal Commission on Technical Instruction in their report to Parliament tell an interesting story of how Mr. Wanderly, a Swiss manufacturer employing a large force of employes, learned his business. The thoroughness of his voluntary training is worthy of the attention of the many who are now solicitous to find a royal road to technical knowledge. After completing his ordinary school education in Switzerland and becoming familiar with the general routine of the cotton factory, he went to England to study the language and the habits of the people, and also to learn every detail of the cotton industry. For a time he was in a broker's office in Liverpool engaged in noting and sampling the raw material. He mixed with buyers and sellers, and studied the system of commercial accounts. Subsequently he went through one or two spinning mills as a machinist apprentice, keeping mill hours, associating with the workmen and living among them. From that he went out as an assistant in setting up machinery in several large mills. Afterwards he entered a merchant's office and warehouse, and became acquainted with the details of the exportation and distribution of cotton yarns. During all this time he wrote regular weekly reports to the firm of which he was the destined heads giving particulars of his progress and of his impressions of English methods.

We clip the following item from the *Bulletin of the American Iron and Steel Association:*

"In the last *Bulletin* there appeared a paragraph, taken from a daily newspaper, concerning the manufacture of ten breech-loading rifles for the new naval cruiser Chicago, in which it was stated that 'the steel for the tubes and jackets was imported, from the fact that no concern in the country would manufacture the steel.' Mr. R. W. Davenport, the superintendent of the Midvale Steel Company, which is manufacturing the rifles, says that 'the statement is not correct, as we are making all the parts of our own Midvale steel. The greater part of the machine work, and the putting together of the guns is done at the Washington Navy Yard. The tubes and jackets for some eight-inch guns, which are being constructed by the Navy, had to be imported from England, owing to the fact that our appliances are not at present equal to the handling of such heavy steel forgings as those required for guns of this size.'"

Texas Takes Water.

It used to be thought that Texas had something of an antipathy to water, but if we can judge from recent reports, the people of the Lone Star State are proposing to "take water" on quite an extensive scale. We do not refer to the recent floods which have so materially interfered with railroad travel and traffic, but to the simultaneous determination shown by eight or ten thriving Texas towns to establish water works at an early date. When it is remembered that only three or four years ago, the sites now occupied by these inchoate cities were the haunts of the prowling coyote, the measure of Texas growth and enterprise appears to good advantage.

The leading apostles of women's rights in New England counted for themselves a great triumph a few years ago when they obtained admission for female students to the Massachusetts Institute of Technology. It was expected that many young women would avail themselves of the opportunity thus opened to obtain a good technical education, and that the cause of female education generally would be benefited by the wide field of instruction opened for the sex. Events have not indicated that the rising generation of women were so anxious to profit by the advantages of technical education as their champions asserted. At a recent examination of students seeking admission to the institution, 192 boys and 1 girl appeared.

Lipe's Heavy Universal Milling Machine.

The machine herewith shown has been recently enlarged and improved in several important details. An extended description of this machine, as formerly built, appeared in the AMERICAN MACHINIST of June 10th, 1882, and in modified form in November 3rd, 1883.

The widely varying nature of the work that a machine of this kind is called upon to perform makes it highly desirable that the machine should be so designed as to be capable of accommodating the largest possible variety of requirements; also that the necessary changes may be easily and quickly made. It is claimed that these results are worked out in this machine to a high degree of efficiency.

The table is 40 inches long, and has automatic feed in either direction its entire length, with stop motion at any point. The table may set at any angle with the column without affecting the feed, as in cutting spirals. The table being gibbed to slide directly on the knee, the strains incident to the cut are resisted by massive parts and few joints. The adjustment in line with spindle is provided for in the moving head on top of the column, provided with long bearings and clamping screws, the limit of movement being 12 inches. The head is moved with a lever operating a pinion which works in a stationary rack set in the top of column.

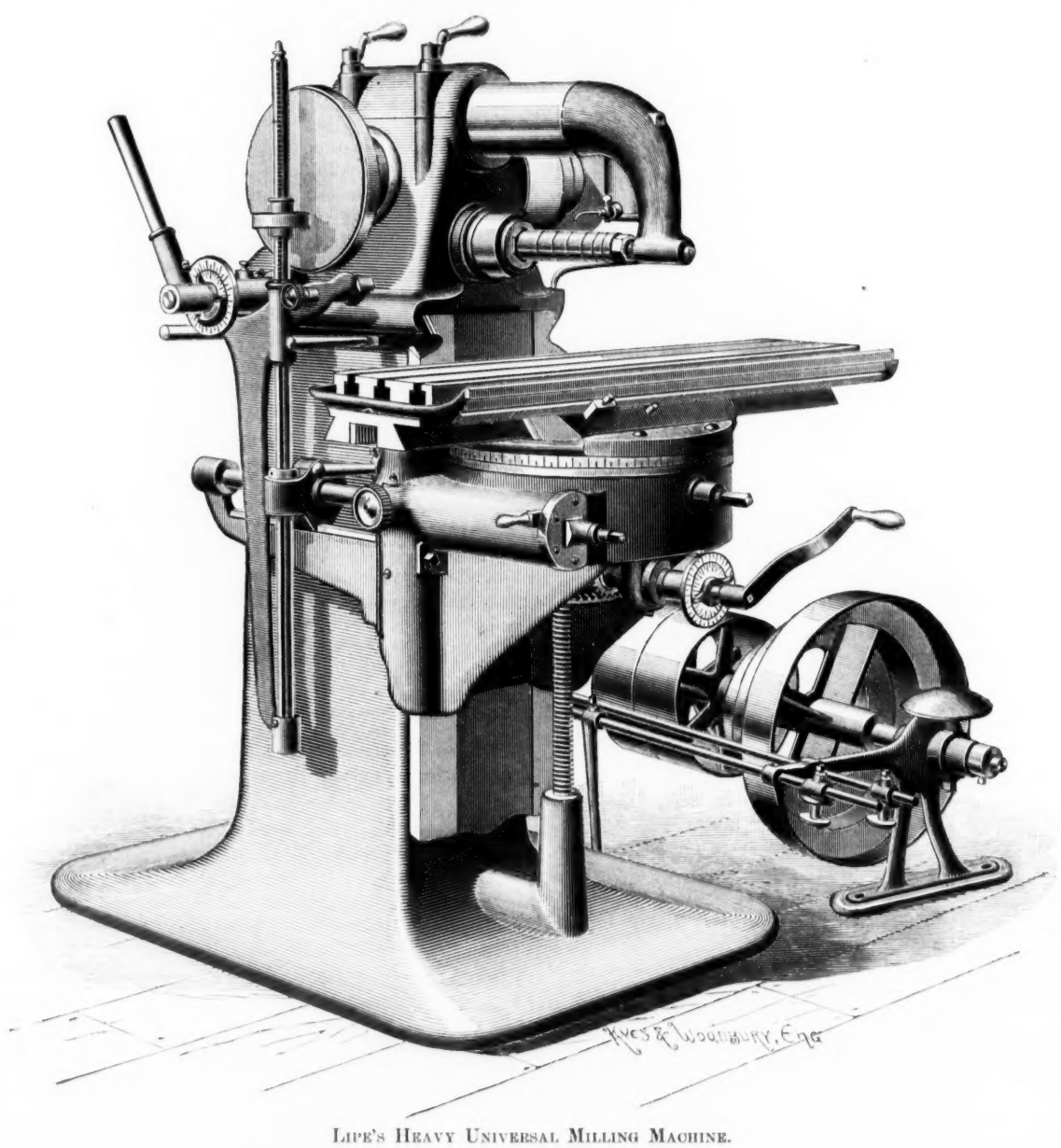
A friction disk feed provides for all rates of feed between 0 and $\frac{1}{16}''$ per revolution of spindle. The feed connections are self-adjusting for all movements of the head and knee.

The spindle is made from best cast-steel, has taper bearings accurately fitted, and is driven with a hardened steel worm and bronze gear running in oil. The size of spindle at the front end of bearing is $3\frac{1}{2}''$ diameter. It has a hole through its center $1\frac{9}{16}''$ diameter. A hexagon enlargement of the arbor fitting a driving cap screwed on the end of spindle prevents the turning of the arbor.

Large wearing surfaces accurately scraped are provided for the sliding parts.

The counter-shaft is driven with a $4\frac{1}{2}''$ belt, and is provided with two sets of tight and loose pulleys for doubling the number of speeds. Six changes are thus provided, giving a range of from 16 to 120 revolutions per minute for the cutters. Vise, centers, spiral attachment, bolts, wrenches, etc., complete the universal outfit.

This machine is made by C. E. Lipe, Syracuse, N. Y.



LIPE'S HEAVY UNIVERSAL MILLING MACHINE.

The use of iron ties for railroad track is almost unknown in American railroad practice, but the indications are that within a few years metal will begin to supersede wood for this purpose. Our vast railroad mileage takes such an enormous quantity of new ties annually that the supply is getting short, and the day is at hand when the remnants of the American forests will be exhausted as a means of providing timber for ties. Then iron or steel will be resorted to, and ties made from that material. All the difficulties that now obstruct the way to using metallic ties will disappear, and it will come to be as great a surprise that the troublesome, always rotting wooden ties were ever tolerated, as it is now that slab rails laid on wooden stringers were ever popular with any class of railroad men. The wood chopper and the sawyer have to yield to the machinist, the blacksmith, and other iron workers, who will soon find occupation making metallic ties.

Condition of Artisans in Europe.

We have received the privilege to take the following extracts from a private letter written to Mr. Geo. Marshall by a friend in Glasgow, Scotland, who is an engineer for the Babcock & Wilcox Company:

"Our company started new works on this side in the year 1881 for the manufacture of their water tube boilers, and they have met with very fair success. We now have them placed in several large mills and different works, here in England and on the continent. I have spent some time in England, France, Germany, Belgium, Switzerland, and Italy, attending to the work connected with boilers we have in these countries. Thus I have been enabled to see some of the old world, and its sights, manners, and customs.

"Trade is not so brisk here as it has been, owing to bad depression in shipbuilding, which affects all other trades. Still, we are doing quite well, considering that we are comparatively new comers, and our boilers are only becoming known here. People on this side of the water do not take hold of any new invention with the same avidity as they do in the States. They want to wait and have some one else try it before they do, and I have been surprised to see them use the old-style Cornish and Lancashire boilers instead of the modern styles. There are a great many Galloway boilers used here, and I see they are now made in Wilmington, Del. Sectional boilers are coming more into use each year as they become better known, and in time we expect to have a large trade.

"There was an article in the AMERICAN MACHINIST on the difference between the American and European artisan, which I can vouch for as being correct, and it formed the subject of many conversations among those that I became acquainted with on this side. The artisan here does not receive the same money for his work, nor does he have the same pride in either himself or his work. Boiler makers get from 30 to 36 shillings per week, and an exceptionally good man gets as much as 40 shillings. The workman is constantly being cut down to the lowest possible wages, and in consequence he is on the alert to do just as little as possible for the money. With the exception of those on piece work, a man here does about the same amount of work in a week as would be done by one of our mechanics in four days. Drunkenness is terribly prevalent among the men here. A workman who does not drink will, I think, live longer on this side than with us, as he does not have such hard work to do, or rather he has more help to do his work with, and he also has more recreation and holidays. Take to-day, for instance, which is the Queen's birthday. Business is suspended, and all the people are out having a holiday. The stations and steamers are full of people going to the country, and all are bent on enjoying themselves, and Scotchmen are always having a little 'mountain dew' to help them pass the day pleasantly.

"The workman of France does not get drunk, but he enjoys himself better. During the whole time I was in France I never saw but two drunken men, and they were only just happy drunk—not fighting or wanting to pick a quarrel with every one. When a Frenchman has his holiday, he takes wife and children to the fields or to the *cafe*, and spends the day there with them. He drinks the light wines of the country, and so do the children, as they do every day of the year; but there is no getting drunk.

"The German workman takes his family to the beer garden, and enjoys himself with them over the beer, and you know they can punish a quantity of it.

"The Italian has his wine or beer when out on a holiday, for both are drank freely in that country; but the man has his family with him—that is, if he has one—if not, he takes somebody else's family. Of the different nations I have seen, the Italian is the laziest. He can go to sleep in a boiler with ten gangs of riveters working on the outside, and their motto is 'never do to-day what can possibly be left off till to-morrow.' I notified the government boiler inspector once in Milan to come and examine the boiler previous to my getting steam on it, and I had to wait ten days before he appeared. Boiler makers in Italy receive about 80 cents a day, and children work there at such an early age that one wonders how they ever live to grow up men and women. I saw girls not over ten years old working in a factory there for ten cents a day, and they had to keep at work ten hours each day."

The New Steamer America.

The most extraordinary voyage for speed across the Atlantic has just been made by the steamer America, a new vessel belonging to the National Line. In her maiden trip this ship has made the passage from Queenstown to Sandy Hook in six days and fifteen hours, beating the first trip of the Oregon by ten hours. The America was built by James & George Thomson, Clyde Bank, Glasgow. In designing the hull, the builders departed from the stereotyped form of ocean steamer, and the lines of this vessel resemble those of the old Aberdeen clippers so famous as sailing ships twenty years ago. When the keel of the America was laid, the builders guaranteed that the ship would be as fast as anything afloat, and she has already beaten every record that had been made up to that time. Apart from the high speed maintained, the vessel is a decided success as doing the work far more economically than any other fast boat. The America has a displacement of 6,500 tons, and has engines rated at 8,500 horse-power. The engines did the work of propelling the ship with a daily expenditure of coal under 200 tons, while the Oregon's engines require 150 tons a day more coal to keep them in steam. This makes an enormous difference in the expense of operating the two steamers.

The America is built of steel, and the hull dimensions are: Extreme length, 480 feet; extreme breadth, 51¼ feet; depth of hold, 36 feet. From this it will be seen that she has a much wider beam than most of the fast steamers. The engines are of the ordinary vertical inverted compound type, with one high pressure and two low pressure cylinders. The high pressure cylinder is 63 inches and the low pressure cylinders 91 inches diameter, all having a stroke of 66 inches. The cylinders have all piston valves. Independent rotary circulating pumps are used, and all the latest improvements and conveniences are applied to the engines. There are seven boilers, with a total of thirty-nine furnaces of the Fox corrugated type. All the mechanical appliances connected with the working of the ship are as nearly perfect as experience, skill, and care can produce.

The man who attends to his own business is sure of a dividend, sooner or later.

Henry G. Ashton, patentee of the well-known blow back for locomotives and other steam engines, has recently patented a muffler for safety valves. The safety valve is enclosed in a muffler chamber, where its noise is suppressed and means are provided for conveying the steam quietly to the atmosphere.

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NEW YORK, JUNE 28, 1884.

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A Bill to Protect American Labor.

A bill to protect American labor was introduced some time ago in the United States Senate by Mr. George. It was referred to the Committee on Education and Labor, and has been reported favorably by that committee. The issue is now fairly presented whether Congress is in favor of prohibiting the importation of foreign workmen under the contract system, which has grown to be an evil of no small dimensions. There is no need of making this question an issue in this year's political campaign if a majority of the United States Senate are in favor of prohibiting the importation of droves of half-starved foreigners, under contract, to reduce the wages of American workmen. If the bill passes the Senate, it will, no doubt, become a law. The bill provides that the importation or the emigration from any foreign country into any place within the jurisdiction of the United States, of any alien, under any agreement, expressed or implied, that such alien shall work, labor or in any wise serve in said jurisdiction any person or corporation, shall hereafter be prohibited, and that every such agreement shall be considered null and void. That any advance of the cost of transportation, or any part thereof, or agreement to pay or secure such transportation for any alien to any place within the jurisdiction of the United States, made by any person engaged in mining, manufacturing, building or transportation, or by any corporation whatever, shall be prohibited. It provides a penalty of $500 for each and every violation of these provisions, and that it shall be a misdemeanor, punishable by a fine of $100 and disqualification for holding office under the United States, for a person while in the United States to violate any provisions of the act, or knowingly aid such violation. It also provides that it shall be a misdemeanor for a master or other officer of a vessel of American register to knowingly bring from any foreign country to the United States any alien who is under agreement prohibited by this act, and such misdemeanor is punishable by a fine of not more than $1,000 for each and every alien so transported in his vessel.

The act shall not be so constructed as to prevent any foreigner or alien coming to the United States, nor from bringing with him servants for personal service or the convenience of his family, nor for the prevention of any such foreigner, while temporarily residing in the United States, from bringing such servants, and it shall not be construed to apply to the appointment of sailors and seamen on vessels engaged in foreign commerce. If any person or corporation shall complain to the President of the United States that he or it is engaged in, or is about to start a business requiring skilled labor of a particular kind, and a sufficient quantity of such skilled labor cannot be obtained in the United States, the President may, on being satisfied of the truth thereof, issue a license to such person or corporation being affected by this act to import such labor, specifying the kind of skilled labor and the number of artisans permitted to be brought to the United States.

If a majority of the Senate are in favor of this bill, it will soon be called up and passed.

Wagon Road Improvements.

There are more new railroad projects in Texas than in any other State, but none of them are yet being carried out. Railroad material can be purchased at low prices, and a line built at comparatively small expense this year; but bonds of new railroads cannot be marketed to good advantage. Even the securities of old and well-established roads are selling remarkably low. But this condition of affairs has not stopped enterprise in the way of improved transportation in Texas. The stoppage of railroad extension has given an impetus to the extension and betterment of wagon roads. Old roads have been made more direct, thereby saving distance in marketing produce, and considerable sums of money are being spent by county authorities in building bridges and making road-beds firm enough to stand during wet seasons. The effect of such improvements is directly beneficial to railroads and general industry. Throughout the Southern States railroad enterprise does not need pushing half as much as common wagon road enterprise. In many localities, where the farmers complain loudly about the cost of sending their crops to market over the railroads, it costs them as much or more to carry them to the railroad station over wretched wagon roads. Transportation improvements should begin at their own doors, and the cost of shipping produce would be lessened without fail.

Natural Tendency of the Labor Market.

We take issue with our esteemed contemporary, the *Industrial World*, on the question of declining wages and the lessening in value of other commodities. It says:

"The tendency of the labor market is naturally downward, and unless there is shortly a change for the better in the iron market, wages must decline. In fact, as all other commodities lessen in value, labor will also grow cheaper. Perhaps it is better not to raise the issue with the laboring men now, but the question must sooner or later be decided."

The question sooner or later to be decided is that of an advance in the wages of labor, and an advance in selling prices of the products of labor. Cheap labor and cheap commodities mean hard times whether in America or Europe. So long as the cheapening process goes on times grow harder. Who wishes to increase that tendency? It is only when labor is fully employed at good wages that commercial affairs are prosperous. The tendency of the labor market is not naturally downward, although there is a general desire to purchase labor like other things, as cheaply as possible. When the tendency of labor is downward an unnatural state of trade exists. In its normal state wages tend upward and productive industries prosper. It should be the aim of every newspaper in the land to aid as far as lies in its power the restoration of business confidence in the future. And it cannot be restored without a tendency towards advancement in wages, and the products of labor.

Proposed Government Exhibit at New Orleans Cotton Exposition.

Should Congress grant the appropriation asked for by the President to defray the expenses of preparing a government exhibit for the New Orleans Exposition, it would present an excellent opportunity for displaying the constructive capabilities of our government departments. If they could not show anything to illustrate advanced practice in mechanical construction, they would be particularly strong in antiquarian relics, that would show specimens of ordnance, naval construction, and machinery of past ages. Some of the venerable wooden ships that are rotting on the stocks in the different navy yards, and are costing money for watchmen and housing, might be launched and towed to New Orleans, where they might interest visitors who have read about but never saw specimens of the wooden walls that used to protect our coast before ironclads were known. Perhaps some enterprising showman might purchase some of these ships, and pass them off as French frigates sunk at the battle of Trafalgar and rescued from the bottom of the ocean by some Jules Verne's process. There are many tools still in use in the government workshops that would be interesting curiosities, for our mechanics would learn by inspecting them what crude machines first-class shop tools have been developed from. An exhibition of this kind would show plainly to the country how faithfully its public departments have remained fast to past traditions, how carefully they have remained stationary while all private enterprises were rushing onward. Then there may be some hopes of a sentiment arising which shall relegate obsolete ships, guns, and tools to the scrap heap or the antiquarian museum, before maintaining them as useful appliances brings disaster to the country.

Tests of Iron and Steel Girders.

Some very accurately conducted experiments were recently made by the Dutch Government to test the relative strength of iron and steel girders. Hard and soft steel girders were put in comparison with iron girders of a good quality. The tests were made by specimens of the material from which the girders were made, and also by actual finished girders. Each of the steel girders showed a large increase in strength over the iron girder. The soft steel girders proved 22 per cent. stronger, and the hard steel girders as much as 66 per cent. stronger. The greater strength of the soft steel over the iron in the specimens submitted was fully attained, and even exceeded, in the girders. The hard steel girders did not show so large a percentage of greater strength over the iron girder as did this material in the specimen over the iron in the specimen. This, however, may be accounted for as the result of punching the rivet holes without reaming, for a girder with punched holes gave way during the trials by a fracture of the tension flange, whereas a girder with reamed holes gave way in the compression flange, and probably would have stood more before fracture had taken place in the tension flange. The latter girder did not appear to bear truly upon its supports, and it was probably this which caused it to fail in the top flange when it did. Punching rivet holes without reaming did not produce any results other than an apparent loss of strength, as compared with reamed holes. The trial pretty well established that the strength of steel girders, strained as these were, is about the same for the two flanges if they are made alike in section.

In spite of the dullness of general business, the number of new manufacturing enterprises projected or under way is by no means small. In the South several large cotton mills are being erected, as well as oil mills, lumber mills, and other manufactories. Western towns are devoting a great deal of attention to new manufacturing enterprises of various kinds, and considerable progress is now being made in that direction. In the East, where a more conservative spirit has ruled, the people of many towns and cities of importance have become quite active in offering inducements to new manufactories to locate within their borders. Notwithstanding periodic seasons of dullness, and the agitation of "reformers" who wish to destroy our protective tariff, the future of manufacturing in this country is one of great promise.

In manufacturing machinery, it is conceded we can beat the Europeans, but in appliances for doing work in boiler shops we are behind the British. Few American boiler shops are provided with the best appliances for bending plates, drilling, punching, flanging and riveting. Although the work turned out is just as good as can be produced on the other side of the Atlantic, the facilities for doing the work are generally inferior. There is room for great improvement in boiler shops.

The proprietors of summer-resort hotels are sending out their attractive circulars, accompanied by schedules for prices of board and rooms. We have received several, and have compared them with last year's announcements by the same parties. A remarkable sameness is noticed when the comparison is made. The attractions seem to remain just the same as last year, and so do the charges for entertainment. None of the hotel-keepers seem to realize that both wages (including "incomes") and the prices of many commodities have declined. They do not seem influenced by the fact that several bankers and financiers, who spent money freely last summer at fashionable resorts, will pass their vacation this season in Canada, or Europe, or the penitentiary. Their houses were not filled last year. How do they expect to fill them this year without a reduction of rates? The assurance of summer hotel men is wonderful.

The State of Nevada, which has two Senators and one Representative in Congress, has not so large a population by 617 as the city of New Haven, Ct.

A single English syndicate owns 4,500,000 acres of land in Texas. Foreign capital altogether controls an aggregate of 21,000,000 acres in the State.—*Houston Post.*

Literary Notes.

Robert Clarke & Co., of Cincinnati, have just issued a new catalogue of American and foreign books relating to applied science. They announce that they will be pleased to send a copy to any address upon application.

The Locomotive is published monthly by the Hartford Steam Boiler Insurance Company, Hartford, Conn. It is intended for free distribution through the various agencies of the company. Parties who wish to have the numbers mailed to them direct from the office as soon as issued, will so receive them by sending fifty cents a year to cover cost of mailing and postage. *The Locomotive* contains no advertisements other than that of the company that publishes it, and it is always filled with matter of interest and value to engineers and steam users. The bound volumes, indexed, are issued for mechanical and other libraries. In some cases they are sent complimentary. The company binds a limited number of them, and will supply those at a dollar a volume.

The *Bolt* is a magazine published once a year by an association of students of the Stevens Institute, Hoboken, N. J. The number for 1884 is particularly bright and spicy, and is gotten up in good taste both as to illustrations and reading matter.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(250) Subscriber, Dundas, Canada, asks: What is used for making steel castings? *A.*—Peculiar qualities of steel, consisting of iron and small percentage—usually fractions of one per cent.—of other substances, such as carbon, silicon and manganese.

(251) J. L. S., Waterbury, Conn., writes: Where I am now employed they use a mixture of four parts lead and one part antimony for lining boxes. Has it any value for that purpose? *A.*—Where the duty required is light, such a lining will do fairly well.

(252) J. R. B., Manchester, N. H., asks: How shall I prepare a vertical boiler for laying up for the season? Some say fill it full of water; others say leave it without water in it. *A.*—We should prefer letting the water out and thoroughly drying the inside of boiler, then close it air-tight.

(253) J. M., Elizabethport, N. Y., asks: What would be the temperature of air at 500 lbs. per square inch pressure? *A.*—Air compressed from atmosphere and a temperature of 60° to a pressure of 500 lbs., without loss of heat, would probably have a temperature of about 1,000°. There is not sufficient knowledge of the subject to say exactly what the temperature would be.

(254) A. F. W., Providence, R. I., asks: In a pair of Corliss, or other engines, should the cranks stand exactly at right angles? *A.*—We believe as good a plan as any is to place the cranks at right angles. At the same time a slight variation is not recognizable in the running of the engines. Sometimes the cranks of compound engines are purposely placed a little out of a right angle.

(255) I. B. G., Milroy, Pa., asks: 1. Which kind of spiral spring is best—one coiled close or open; and what proportion should the diameter of spring be to the diameter of shaft? *A.*—It depends upon what you are to use the spring for. In making a spring for constant use, it is best to get considerable length of wire, hence it is better (when the spring is used by distension) to coil close together. For similar reasons a spring of larger diameter is better for most purposes than a small one. You must be governed by circumstances. 2. Cannot more power be had from two short than from one long spring? *A.*—No.

(256) J. C. E., Chicago, Ill., asks: 1. How can the beautiful colors seen on case-hardened work be had? I have tried case-hardening with prussiate of potash, but cannot get the colors. *A.*—You can get the colors by using the right material and case-hardening in a furnace. 2. Can glass be turned in an ordinary lathe? *A.*—We have heard that it may be, but are not acquainted with the process.

(257) O. Z., New York, asks: 1st. What advice we would give to a young machinist who would like to practice steam engineering? *A.*—We would say make yourself thoroughly proficient in your trade and devote your evenings to studying the science of steam engineering. Attending the Cooper Institute evening classes would help you along. 2d. Would a position on the Elevated Railroad be a good place for a person to advance himself? *A.*—We think not. A perusal of our article in the issue of September 15, 1883, on operating the Elevated Railroads will give answers to your other questions.

(258) J. C. R., Jamestown, N. Y., asks: In putting up shafting on the underside of 8″x10″ beams in a dye-house that is almost always filled with steam, I claim a bolt through the beam is better than lag-bolts. The man in charge says the lag-bolts are better, as, when the wood shrinks, the through bolts will be loose. Which is right? *A.*—If the shafting is light, the lag-bolts are as good for all purposes as the through bolts, and, as your opponent says, are not as likely to permit the hangers to become loose by shrinkage of timber. Lag-bolts are very generally used for such purposes, sometimes for heavy shafts.

(259) W. L., Buffalo, N. Y., asks: 1. What is the formula or rule for gear-cutting? *A.*—The information cannot be comprehended in a formula or rule. It will be necessary to study up the subject of wheel gearing. 2. How can I make a pitchometer for measuring the pitch of propeller wheels? *A.*—We have no knowledge of such an instrument. The pitch of a propeller may be calculated by measuring the advance of the angle of the blade for a definite part of a revolution. Thus, suppose the wheel has a circumference of 60″, and in a distance of 12″, or one-fifth the circumference (at right angles to the axis), the angle shows an advance of 15″, the pitch will be 75″.

(260) H. D., Philadelphia, Pa., asks: 1. What surface speed should the surface of milling cutters have for cutting steel, iron and brass? *A.*—The speed proper to run milling cutters varies so much with the character of the work that it is impossible to give any rule. Soft steel and wrought iron are milled at speeds from 20 to 30 feet, cast iron from 30 to 50 feet, and brass at about the latter speed. See answer to Question 111, April 1, 1882; also article on the milling machine, by John J. Grant, October 13, 1883. 2. I figure the following numbers for index to give a variety of changes, viz.: 26, 28, 36, 40, 44 and 48. Can you suggest anything better? *A.*—The numbers appear to be right, so far as they go.

(261) F. H. H., Weymouth, Mass., writes: I have a well, 33½ feet deep, in which there is never more than 13 feet of water. In it, 14 feet from top, I have a Worthington pump—steam cylinder, 4½″; water cylinder, 2¾″; 4″ stroke. I want to set the pump in my engine room, which is about 15 feet from well. Do you think the pump will draw all the water from the well, the lift being 34 feet, if I arrange the pipe as shown by David Stewart in the AMERICAN MACHINIST of December 8, 1883? *A.*—We have never had experience in pumping water by suction from such a depth, and should not recommend you to try it if a failure will inconvenience you. At the same time, we do not question Mr. Stewart's statement of the facts as he understands them.

(262) A. D. H., Pensacola, Fla., writes: One day last week while pressing on a car wheel it was burst at a pressure of 45 tons. Two or three days afterwards the horn on end of ram, that carries chain with weight, broke off. It is claimed by many that the sudden jar of the breaking wheel cracked the horn so that it afterwards broke. I claim that the wheel fell against the horn and broke it. Who is right? *A.*—We should say that either may be right, with strong probabilities in favor of your hypothesis. 2. I was shrinking a band on a piece the other day and was told to cool it while red hot, to get greater shrinkage. I thought it should be left to cool slowly. Which was right? *A.*—Cooling the band suddenly, before the piece on which it was shrunk could expand from heat, would undoubtedly shrink the band a little closer to the piece, but we do not think the band would be as strong as if allowed to cool slowly.

(263) F. A. B., Jersey City, N. J., asks: 1. How is a wiped joint made on lead pipe, and is acid used in the operation? *A.*—Acid is not used. Making a satisfactory wiped joint is an operation that requires a good deal of skill, and the processes of different workmen vary slightly in detail. Generally speaking, in making a wiped joint the parts to which the solder is to adhere are first scraped or shaved quite clean, and smeared with tallow. Then solder from a ladle is poured over the surface until it raises the temperature so that it adheres. To complete the joint, the solder is poured on slowly, and *wiped* into shape as it is poured on by means of a cloth—usually a piece of bed ticking—folded several times and well tallowed. 2. What is a spring joint in steam fitting? *A.*—A joint in the pipe so arranged as to take the spring caused by unsteadiness from any cause, thus relieving the line of pipe. Sometimes such a joint is made by using a small copper drum corrugated all over. 3. How are band saws mended? *A.*—By scarfing the ends and brazing or silver soldering them together. 4. How can I use zinc in a 30 horse-power boiler to prevent scale? *A.*—Suspend a piece weighing from one to two lbs., by means of a wire, in the water space of the boiler near the bottom. We canot say that it will prevent the formation of scale.

Business Specials

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Mackenzie Cupolas and Blowers, 245 Broadway, N.Y.

Springs—List free. T. F. Welch, 11 Hawkins st. Boston.

Presses & Dies, Ferracute Mach. Co., Bridgeton, N. J.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Interchangeable work a specialty. Send stamp for new Lathe Catalogue. E. O. Chase, Newark, N. J.

For first-class machine patterns and estimates, address John Valentine, 15 Alling st., Newark, N. J.

INVENTIONS perfected, designed, or patented. E. P. Robbins, M. E., Cincinnati, O.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John street, N. Y.

Fine tools and special machinery. Horace Thurston, 84 Clifford street, Providence, R. I.

Herbert W. T. Jenner, Mechanical Engineer and Solicitor of Patents, 632 F st., Washington, D. C.

Lyman's Gear Chart. How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn.

Foot Power Machinery, for workshop use, sent on trial if desired. W.F. & John Barnes, Rockford, Ill.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

Universal grinders for lathe-centers, chucks, angles, or cylinders. C. C. Hill, 84 Market st., Chicago, Ill

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

National and box chucks, foot and power lathes, and slide rests. Lodge, Barker & Co., Cincinnati, O.

DRAWINGS—Mechanical, electrical and Patent Office. All styles of artistic designing. Special facilities. Low rates. Wallace Metcalf, 140 Nassau Street, N. Y.

Split Pulleys at low prices, and of same strength and Appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Improved Tack Machinery, made by The Willets Man'f'g Co., can be seen in operation at their works, 57 Clifford St., Providence, R. I.

The "Wax Process" Engravings shown in the AMERICAN MACHINIST each week are made by Struthers, Servoss & Co., 32 Frankfort Street, N. Y.

Difficult machines invented and built; coarse screws cut. V rotary files for fine milling, by mail 50 cts. Tower Machine Works, E. Brookfield, Mass.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large: prices low. Frasse & Co, 62 Chatham St., N. Y.

The Complete Practical Machinist, $2 50; the Pattern Maker's Assistant, $2.50; Mechanical Drawing Self-taught, $4 00; books for practical machinists. Address, Joshua Rose, Box 3,306, New York City.

EXTRACTS FROM CHORDAL'S LETTERS, 400 pages, 12mo., handsomely bound in cloth. New and enlarged edition, with over 50 illustrations. Price $2. Published by John Wiley & Sons, 15 Astor place, New York.

Manufactures.

The Lima (O.) Car Works, recently shut down, have started up again.

Schneedewent & Lee are about to erect a $20,000 factory, at 46 Third avenue, Chicago.

A rolling mill is to be erected at Corning, N. Y., by James Westerman, of Sharon, Pa.

A. Hansske will build a four-story factory at 100 Weed Street, Chicago, to cost $8,000.

Speilman Bros. will erect a three-story factory at 101 Erie Street, Chicago, to cost $6,500.

Gaston & Culbertson, Paris, Texas, have purchased ground for a cotton-seed oil mill.

The Rhode Island Locomotive Works, of Providence, are employing 400 men eight hours a day.

Sarah Myers will erect a two-story factory at 421 West Twenty-second Street, New York, to cost $6,000.

The Tompkins Machinery and Implement Company, Dallas, Texas—capital, $250,000—has been organized.

B. D. & W. N. Eisendrath will build a four-story addition to their factory on Dix Street, Chicago, to cost $10,000.

John Chatillon & Sons, 85 Cliff Street, New York, manufacturers of scales, will erect a new factory to cost $50,000.

For the first time in twelve years the mills of the Exeter, N. H., Manufacturing Company are running by water power only.

The Ross Manufacturing Company, Fulton, N. Y., is looking around for the best offer from a town for the location of new works.

The cotton factory at Raccoon Mills, Ga., is to have 1,500 spindles and 48 looms, and will be ready for operations in September.

The citizens of Memphis are offering inducements to the Louisville, New Orleans and Texas Railroad to locate its machine shops in that city.

Henry McShane & Co., Baltimore, Md., have recently cast a bell for a church in Birmingham, England. The purchasers are well pleased with the bell.

Sterling Elliott, Newton, Mass., has issued a new catalogue of upright drills and cutting-off tools, made by him. It is well illustrated and neatly printed.

The Ottumwa Iron Works, Ottumwa, Iowa, have published a large display card, with fine illustrations of their steam engines, steam pumps and boiler fronts.

Edwin Lee Brown, of the Brown Brothers Manufacturing Company, Chicago, will build this summer a six-story factory, 85x106 feet, at corner of Clinton and Jackson Streets.

The Dayton Coal and Iron Company, of Dayton, Tenn., is organized to build two 25-ton furnaces at Dayton. The ground has been broken, and their construction will be pushed forward.

Thirty-six of the Fall River (Mass.) mills have adopted the system of paying wages weekly, instead of monthly, as heretofore. It is believed that all the mills will shortly adopt this plan.

The York Manufacturing Company, Limited, of Portsmouth, O., manufacturers of steel scrapers, will enlarge their factory by the addition of another story. They will also manufacture skates.

The Lane & Bodley Company, of Cincinnati, recently erected a new shop building, which they have equipped with new and first-class tools for the manufacture of a high-grade automatic cut-off engine.—*Iron Trade Review.*

Pittsburgh has 1,380 manufacturing establishments, with an aggregate capital of $106,000,000, employing nearly 86,000 persons. The annual product is valued at $146,000,000. No wonder free-trade notions find no lodgment in Pittsburgh.

The Pond Engineering Company, St. Louis, have been awarded the contract to furnish two pumping engines for the Victoria (Texas) Water Works. The engines will have a capacity of 1,500,000 gallons per day, and will be of the Blake improved compound duplex pattern.

The Baltimore *Manufacturers' Record* says: "The project for a cotton mill in Aberdeen, Miss., previously reported, is meeting with favor, and over $40,000 was subscribed in a few hours. Proposed capital, $100,000. Committee in charge—Jacob Guttman, C. W. Gibson and C. C. Heison."

The Westinghouse Machine Company, of Pittsburgh, are having great success with the Westinghouse automatic engine. For February, 1884, they report sales of thirty-five engines, aggregating 975 H. P.; for March, fifty-four engines, with 1,627 H. P.; for April, sixty-two engines, with 2,429 H. P.

The New York Dye Wood Extracts and Chemical Company, 161 Front Street, New York, are about to erect on Greene and West Streets, Brooklyn, two buildings for manufacturing purposes. The large one will be 100x100 feet, six stories high, and the smaller one (engine-house) 29x44 feet. The whole will cost $50,000.

Durkee & Keffer are building a high-speed engine, designed to run 1,500 to 1,800 revolutions per minute, for electric lighting purposes. An especial feature of this engine is a very ingenious rotary automatic steam balance valve. The engine is made under patents recently granted to Dr. John Harrington, Caldwell, Kansas.—*Industrial World.*

The Boston *Commercial Bulletin* says: "The action of the city government of Concord, N. H., on Saturday last, in exempting from taxation the building and stock, machinery, etc., of the Concord Shoe Factory, assures the success of this long-cherished project, and it is expected that the coming fall will see a full force of hands employed in the factory, which is to be erected on the south side of Free Bridge Street.

A new company has been organized in New Haven, under the name of the Automatic Engine Company. The works are located on Union Street. They build a coil boiler with the engine attached, which is very convenient to parties who do not require over eight horse-power, and can be used in a very small room. Mr. Hopkins Sandford is the superintendent for the company.—*Manufacturers' Gazette.*

Broderick & Bascomd, of St. Louis, have nearly completed the erection of their wire works, recently destroyed by fire. The buildings will be considerably larger than they formerly were, and the additional machinery to be used will increase the capacity. Lathes, planers, etc., have already been placed in the works, and the manufacture of the wire-working machinery to be used will be begun immediately.—*Midland Industrial Gazette.*

Owing to the rapid increase of orders for the safety water tube boilers made by Zell & Burton, Baltimore, Md., under the Zell patents, they have leased the large works of the Vulcan Iron Works, of that city, and are enabled to handle any size or number of orders intrusted with them. We understand these boilers are gaining in popularity rapidly. The New York office is 22 Cortlandt Street; L. B. Eaton, general Eastern manager.

Machinists' Supplies and Iron.

NEW YORK, June 12, 1884.

The supply business is quiet.

Iron, pig, American—There has been no material change in the situation since our last report was made. We quote No. 1 X Foundry, $20 to $21; No. 2 X Foundry, $18.50 to $19; Grey Forge, $16.50 to $17.

Scotch—This market has ruled dull and easy. Shotts, $21.50 to $21.75, to arrive; Coltness, $21.50, to arrive, Eglinton, $19.50; Dalmellington, $19.50.

Antimony—Regulus has been in moderate demand. Hallett's, 10½c.; Cookson's, 11c. to 11¼c.

Copper—The call ingot has been quiet. Lake, 14⅛c. to 14¼c.; other brands, 13¾c. to 13⅞c.

Tin—There is no notable change in this trade. The demand is slow and the market dull. Banca is quoted at 20¾c.; Straits and Malacca $18.70 to $18.75.

✻WANTED✻

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Wanted—Situation by a mechanical draftsman. Address, A, Box 3, AMERICAN MACHINIST.

Experienced marine engineer open to engagement. Address, A. Tengvall, American Shipbuilding Co., Philadelphia, Pa.

Wanted—Situation by brass-finisher, tool-maker and experimental machine constructor. Address, W. Mc., Box 2, care AMERICAN MACHINIST.

Mechanical engineer, with theoretical education and extensive practical experience, wants situation. Address, A. O., AMERICAN MACHINIST.

An experienced foreman on specialties in iron and brass is open to engagement. First-class references. Address, Box 14, AMERICAN MACHINIST.

Mechanical engineer, of good theoretical education, wants situation, if possible, within the electric branch. Address, O. O., Box 6, AMERICAN MACHINIST.

A thoroughly-educated mechanical engineer and draftsman, with long years' experience and good references, wants engagement. Address, AMERICAN MACHINIST, Box 5.

Situation wanted by a mechanical draftsman, and who has had eight years' experience as a pattern-maker. Address to E. H., AMERICAN MACHINIST.

Wanted—Position as mechanical engineer or superintendent, or will accept a position as traveling agent or manager, by a thoroughly practical man. Address, M. E., AMERICAN MACHINIST.

Situation wanted, as foreman of a boiler shop. Have had 20 years' experience as foreman, and am conversant with marine stationary and locomotive work. Address George Marshall, care AMERICAN MACHINIST.

Wanted—A first-class superintendent, to take charge of an architectural iron works, who understands plans, and is accurate in figuring quantities. Must be strictly temperate and have good recommendations. No others need apply. Address Wm. Bayley & Co., 340 Second avenue, Milwaukee, Wis.

Wanted to Buy—A Gould & Eberhardt old-style 36" gear cutter. Address "Worm Wheel," AMERICAN MACHINIST.

For Sale—One No. 2 Brainard Universal Milling Machine, as good as new. Wells Brothers & Co., Greenfield, Mass.

Wanted—Partner to manufacture a new injector for feeding water into steam boilers, on half interest or royalty. Address, Injector, Box 9, AMERICAN MACHINIST.

Wanted—Second-hand screw-cutting engine lathe, to swing not less than 50 inches and take about 13 feet between centers. Must be of modern build and in first-class order. Address D. J. Murray Manufacturing Company, Wausau, Wis.

"ECLIPSE" HAND PIPE-CUTTING MACHINE.
Simple, Powerful, Portable, Inexpensive. With it one man can easily cut 6-inch Pipe. Made in three sizes.
Address, for Prices, &c.,
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Tapped to Standard Gauges. *Adjustable* to all variations in the size of fittings. Can be *resharpened without drawing the temper* by simply grinding them. Possessing practical advantages appreciated by all mechanics. Circulars sent free on application.

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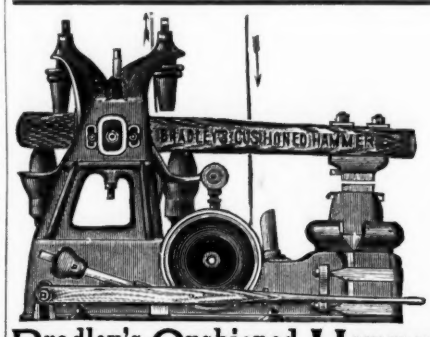

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OVER 800 IN USE.
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As we shall commence immediately the erection of new buildings, to meet the wants of our increasing business, we offer for sale or rent that part of the buildings owned and occupied by us as a foundry and machine shop. Foundry is 40 x 70 ft.; machine shop, 40 x 70 ft., two story. Warerooms, pattern rooms and office. These buildings will be vacated by us, Oct 1st, and are situated in the heart of the city of Canton, Ohio. The city contains over 21,000 inhabitants with four railroads and five banks. The shops are admirably situated for jobbing and for any kind of manufacturing for from 25 to 50 men. Cost of coal from 80 cts. to $2.00 per ton; and freight from the Mahoning Valley, Lake Superior Iron Furnaces, only one dollar per ton.

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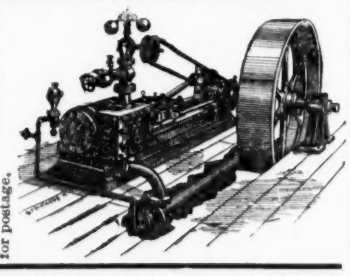
No. 22 Cortlandt Street, New York.
HORIZONTAL ENGINES,
BOILERS AND VERTICAL ENGINES.

In writing for circular, please mention this paper, and state what articles you want circulars of. If you want complete machinery catalogue, please send 20 cents in stamps for postage.



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And Manufacturer of
Special Machinery and Tools, also improved Hand and Wood Turning Lathes. Circulars now ready.

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TRENGTH and QUALITY
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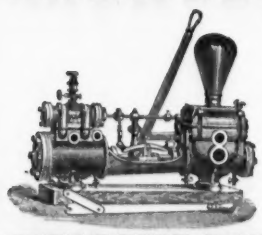

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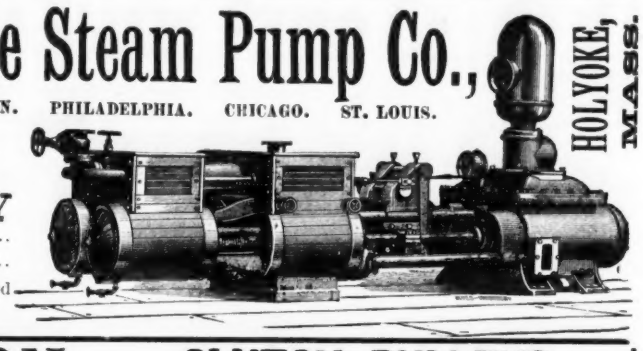

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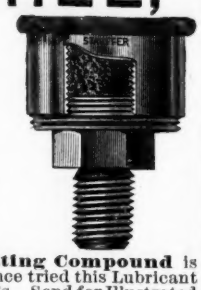

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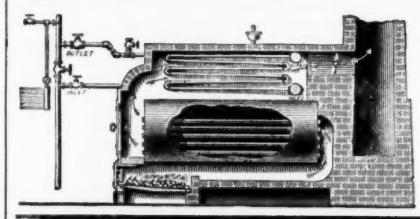

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Tables of the principal speeds occurring in mechanical engineering, expressed in mètres in a second. By P. Kecrayeff. Translated by Sergius Kern. Price, 20 cents. Descriptive catalogue of books, 100 pages, free.

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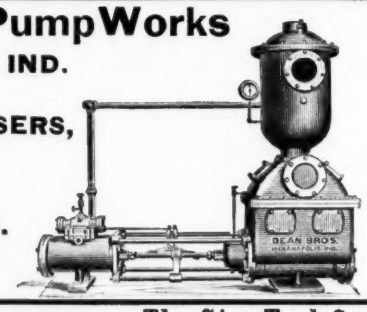

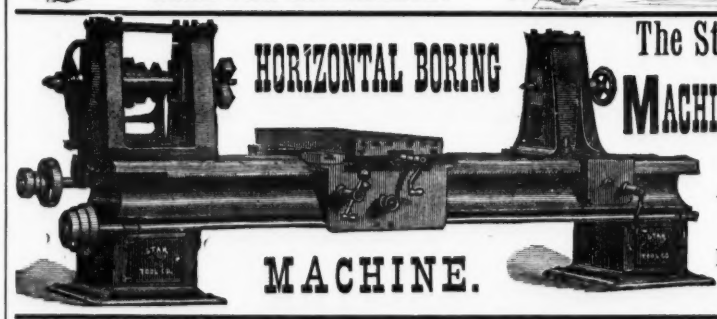

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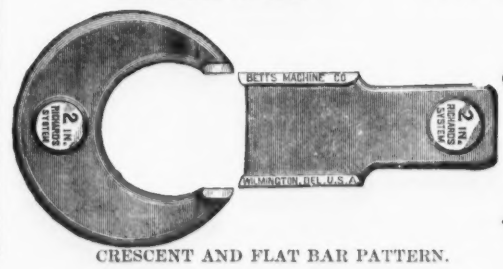

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MEASURING MACHINES,
THREE SIZES.
4 Inch, 12 Inch, and 24 Inch,
Will measure to the 1-10 000th of an Inch.

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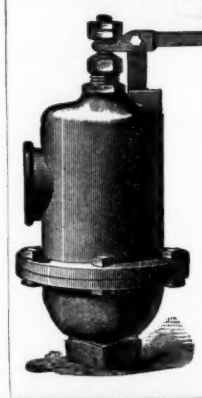

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Yours truly,
S. W. ADAMS, Secretary.

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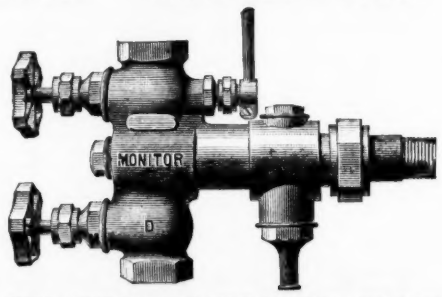

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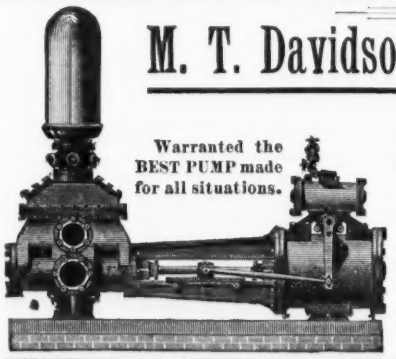

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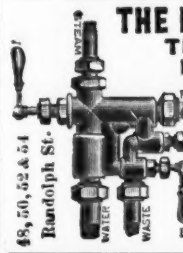

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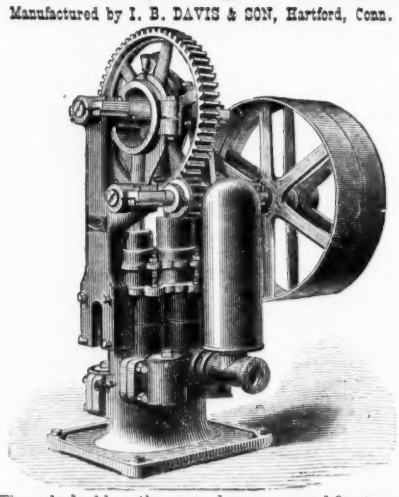

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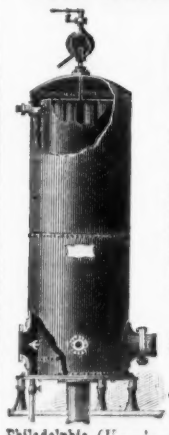

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" 7	1 1-8 "		.95
" 8	1 1-4 "		.95
" 9	1 3-8 "		1.10
" 10	1 1-2 "		1.10
" 11	1 3-4 "		1.25
" 12	2 "		1.40
" 13	2 1-4 "		1.60
" 14	2 1-2 "		1.60
" 15	3 "		1.80
" 16	3 1-4 "		2.00
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Full set, 19 Dogs, $26.35			
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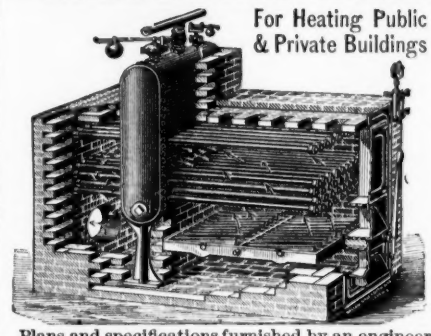

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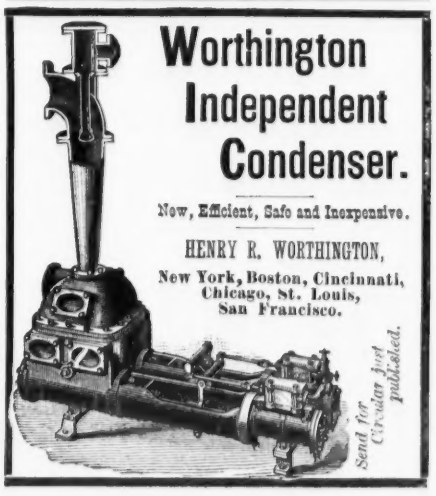

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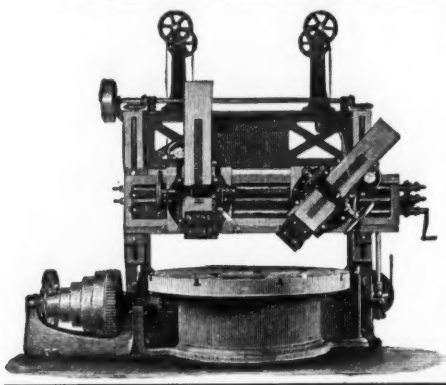

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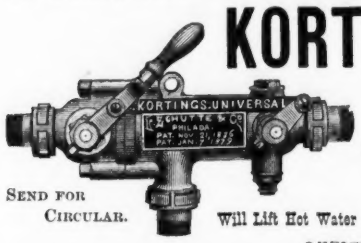

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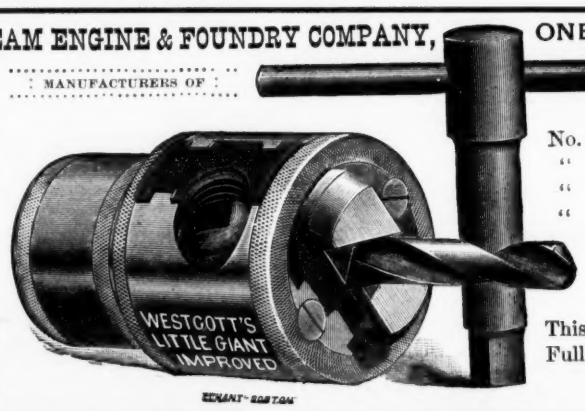

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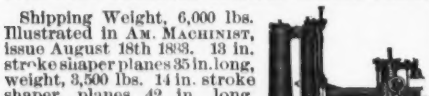

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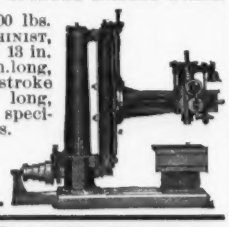

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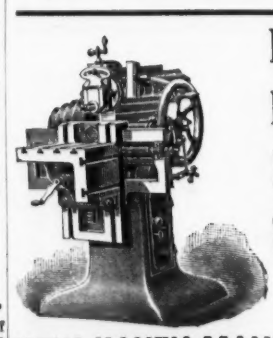

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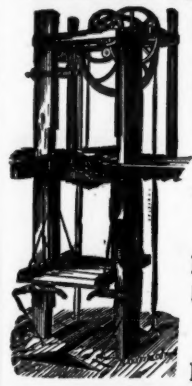

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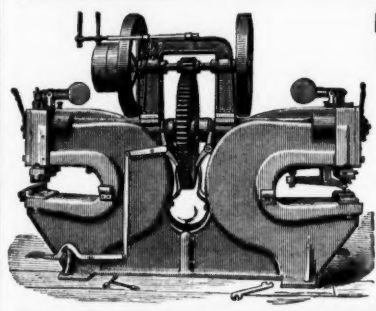

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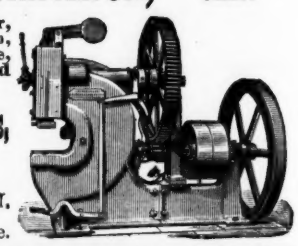

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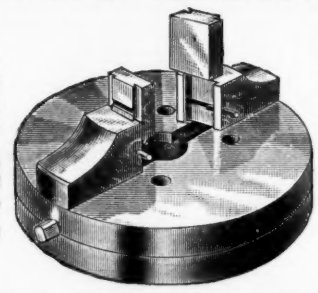

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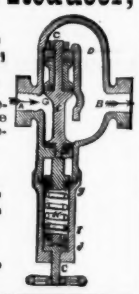

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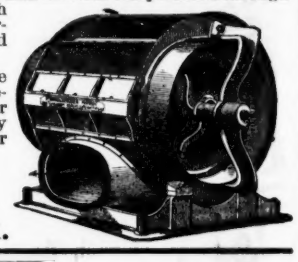

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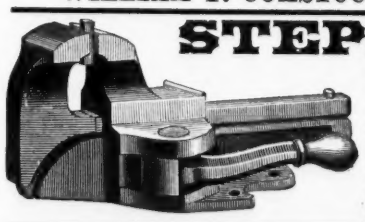

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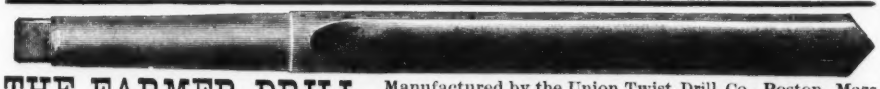

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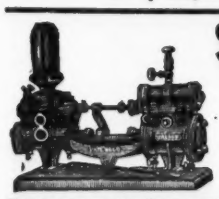

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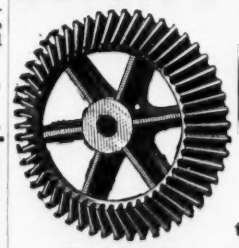

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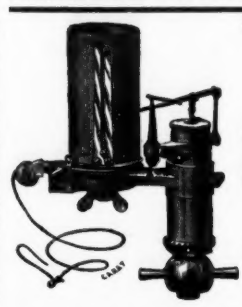

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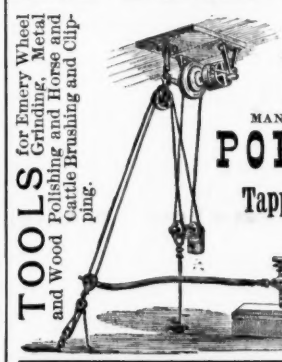

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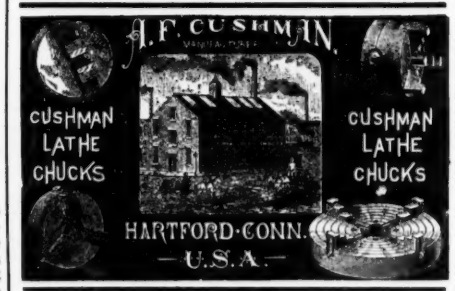

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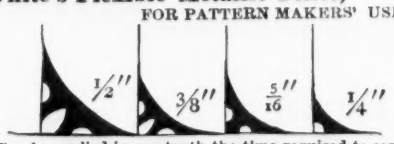

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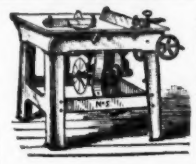

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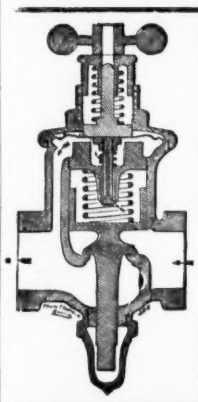

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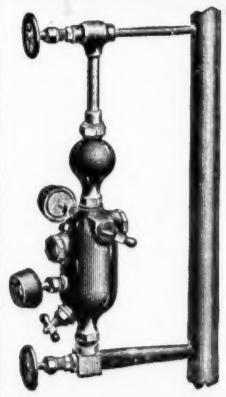

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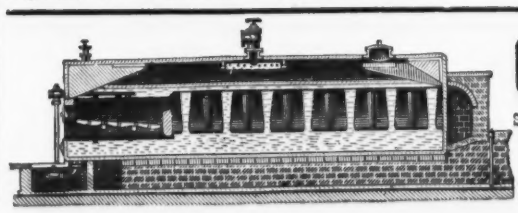

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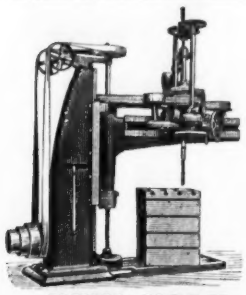

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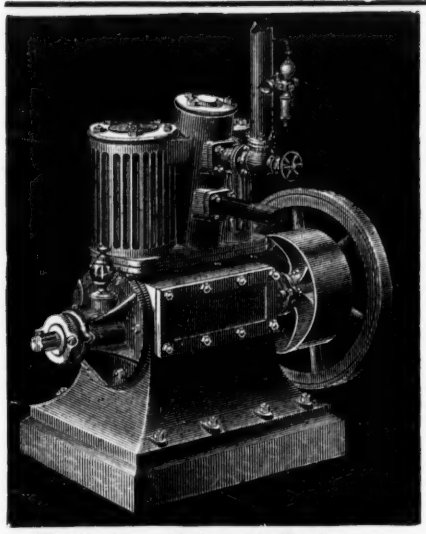

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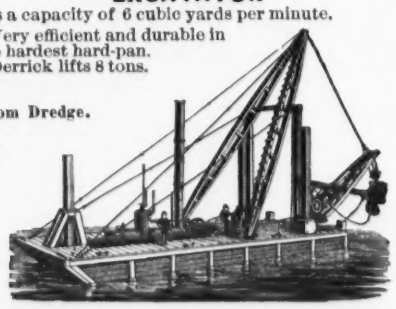

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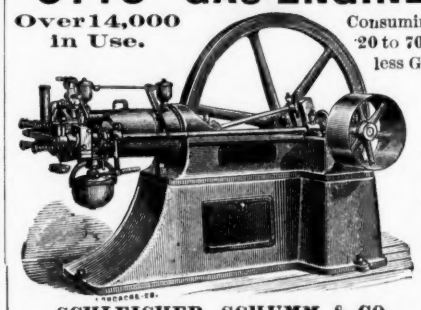

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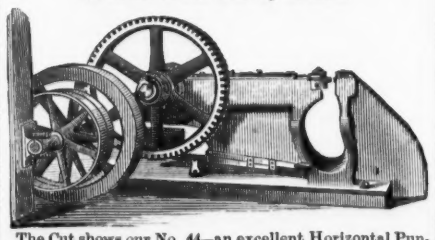

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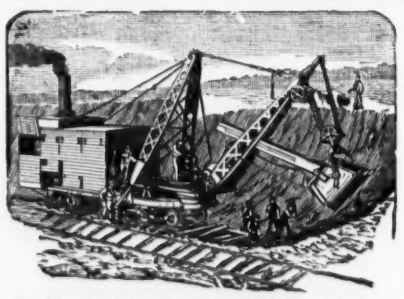

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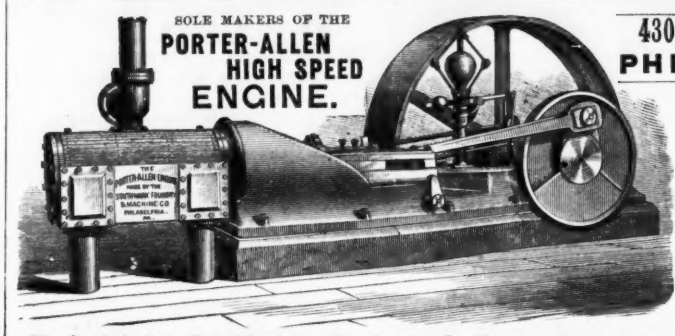

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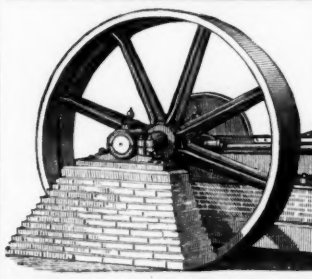

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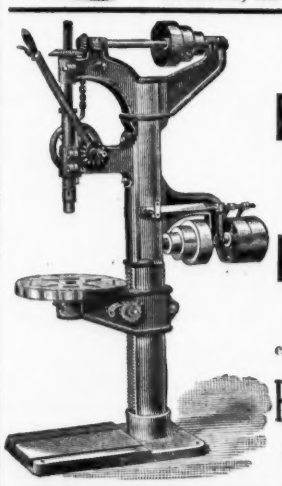

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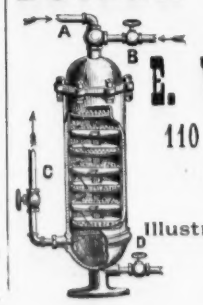

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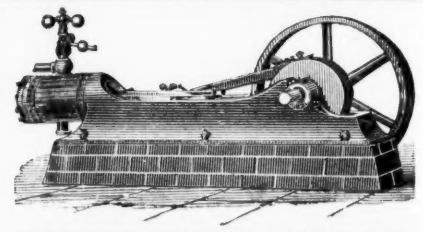

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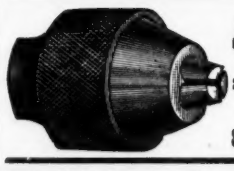

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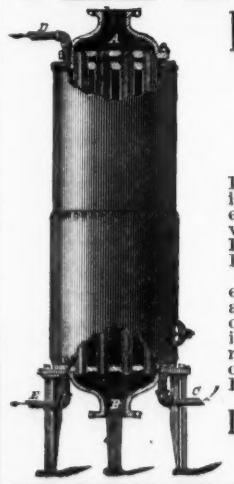

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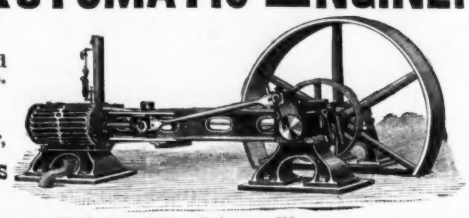

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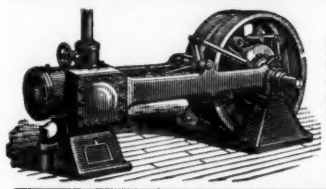

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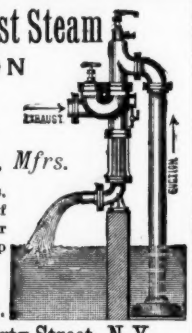

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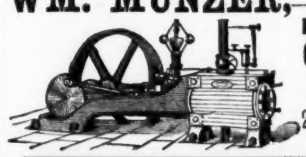

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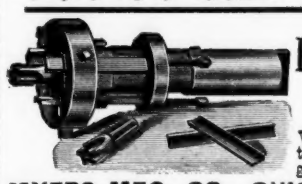

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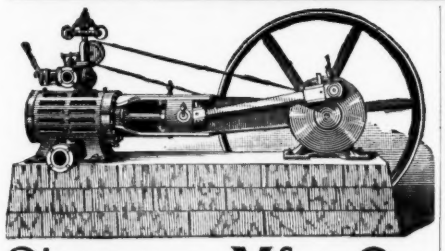

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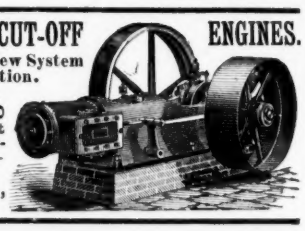

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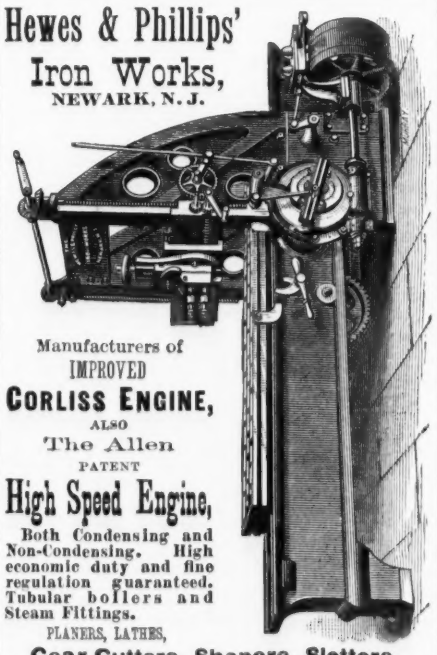

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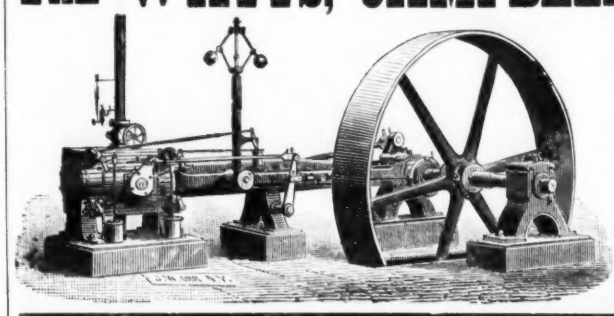

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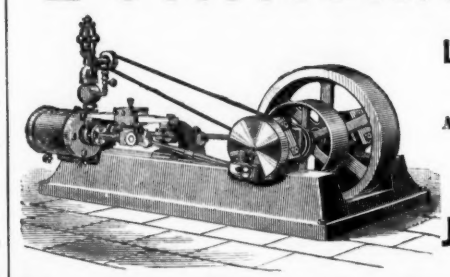

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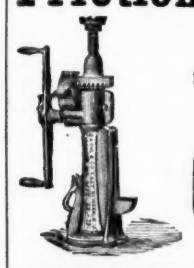

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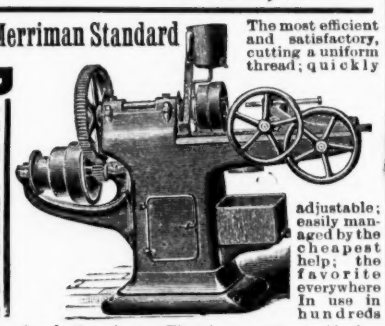

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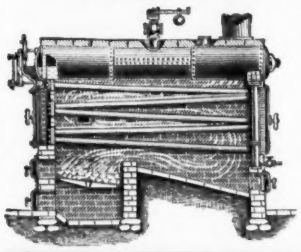

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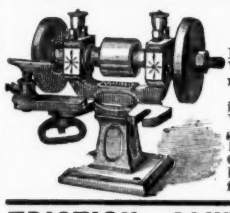

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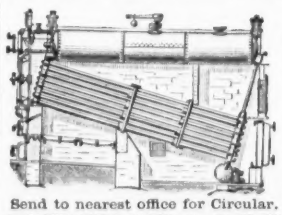

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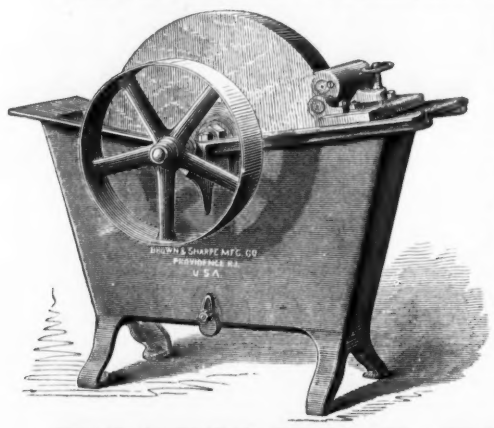

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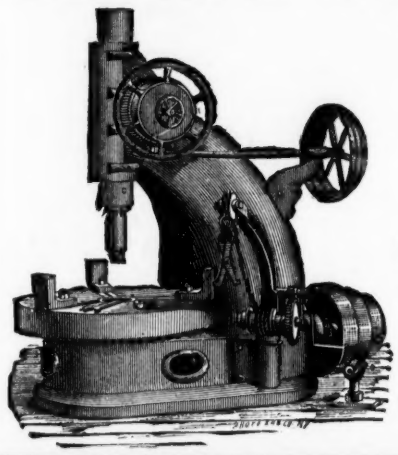

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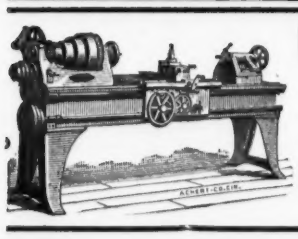

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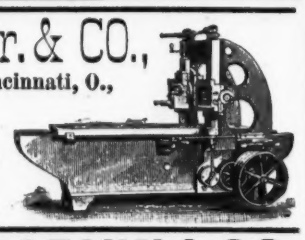

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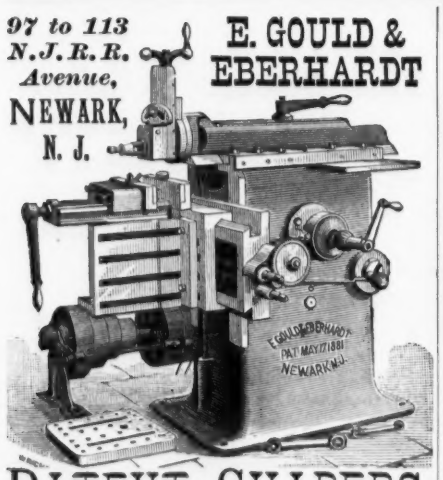

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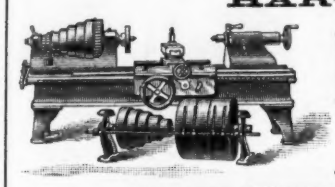

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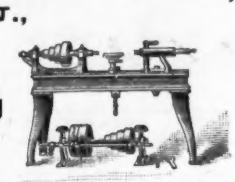

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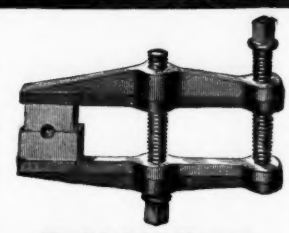

Machinists' Clamps.

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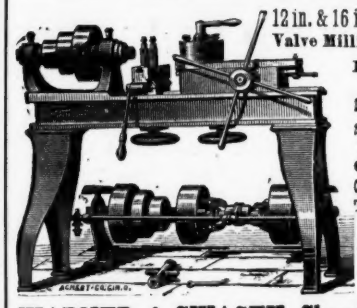

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Speed Lathes
Slide Rests,
Revolving Chucks for Globe Valves,
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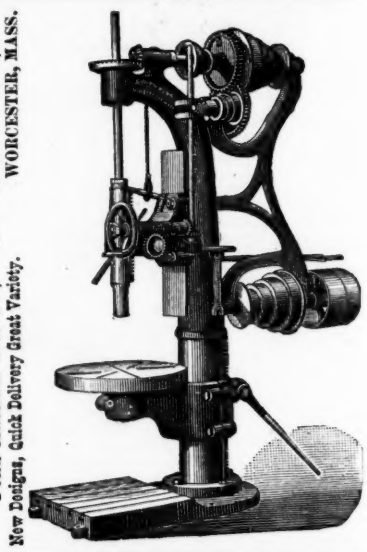

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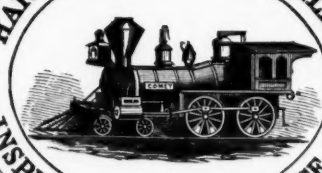

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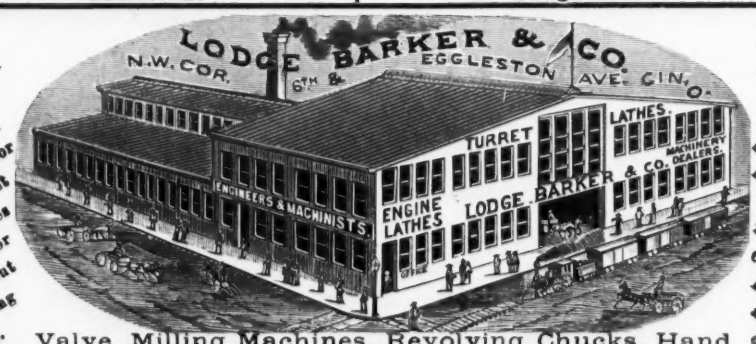

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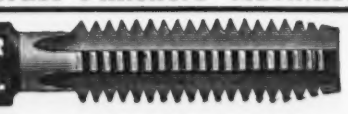

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